Regulation of Compensation and Systemic Risk: Evidence from the UK*

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Abstract

This paper studies the consequences of regulating executive compensation at financial institutions by examining the introduction of the UK Remuneration Code in 2010, which aimed to change the decision-making horizon and risk-taking incentives of bank executives. We find that, although both banks and non-banks show increased contribution and sensitivity to systemic risk in the UK post-2010, this increase is lower for UK banks, in line with the intent of the regulation. However, UK banks also experience higher unforced CEO turnover when compared to other UK firms. Therefore, while the regulation may have had the desired effect on systemic risk, it may also have given rise to some unintended consequences.

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1 Introduction

The level and structure of executive compensation in financial services firms has been a frequently debated topic among politicians, CEOs, and academics since the financial crisis of 2007—2009. Critiques of compensation practices at financial services companies often attribute the crisis at least in part to incentive pay that purportedly encourages excessive risk-taking.[1] US regulators have proposed a regulation that monitors or modifies the level and structure of executive compensation in the financial services industry.[2] The United Kingdom was the first to pass similar regulation on compensation following the financial crisis. In this paper, we use the UK setting to study the impact of executive compensation regulation on financial services firms.

In August 2009, after a consultation period and having considered the recommendations of the Turner Review (Turner [2009]) and Walker Review (Walker [2009a and 2009b], the UK Financial Services Authority (FSA) implemented the Remuneration Code, making the United Kingdom the first country to regulate compensation. This was widely seen as a response to the financial crisis and an effort to curtail pay practices that allegedly contributed to the crisis. The Remuneration Code's objective was to decrease short-termism among executives and other employees in the position of potential material risk influence by requiring them to defer a larger portion of their bonus compensation and by introducing performance-based vesting conditions for these bonuses to increase pay-performance sensitivity and curb risk-taking behavior. Furthermore,

[1] See, for example, the "Statement of Treasury Secretary Geithner to the Senate Subcommittee of the Committee on Appropriations," 111th Congress. "Financial Services and General Government Appropriations for Fiscal Year 2010," 16-17. U.S. Government Printing Office, Washington, DC.

[2] The US Dodd-Frank Act Section 956 explicitly requires changing compensation components and mandatory compensation deferral for financial services employees in positions that might increase the risk of a given institution. The US financial sector regulators proposed the implementation of this section initially in 2011 and revised their proposals in May 2016. The 2016 proposal is more in line with the regulation implemented in the United Kingdom as part of the UK Remuneration Code. This proposal is yet to be implemented.

the Code also required banks' remuneration committees to work together with banks' risk functions and provide regular reports about remuneration practices and compensation levels to the FSA. The Code was initially applicable to the largest banks and later extended to all financial institutions.[3]

Extensive academic literature discusses the relationship between privately set compensation contracts and the principal-agent problem between managers and shareholders. However, even contracts that are privately optimal might impose externalities on outside parties due to a mismatch between private costs and benefits and social costs and benefits, leading to market failure and the possible need for regulation (Anginer et al. [2018]). The theory of regulation goes back to the seminal work of Stigler [1971] and Posner [1974], who argue that regulation might be justified if there is market failure. Market failure is defined as the existence of externalities, such as costs that are not internalized by the market players who give rise to them. In this case, externalities arise because the decisions of banks and their executives affect the risk (and hence cost) borne by other banks, the rest of the economy, and society. This phenomenon is not specific to the financial crisis of 2007—2009 but rather applies to the more general issue that bank failures undermine financial stability, increase the risk of failure of other healthy financial institutions due to banks' interconnectedness through the payment system, and impact the overall economy.

[3] On April 1, 2013, the FSA was abolished and became two separate regulatory authorities: the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA), which is a part of the Bank of England. The Remuneration Code remains in effect. The FCA oversees most of the Remuneration Code for UK BIPRU firms; the PRA with FCA jointly oversees the implementation of the Remuneration Code for financial institutions subject to the EU Capital Directive IV (these banks are also known as "dual regulation firms"). BIRPU refers to firms covered by Chapter 1 of the Prudential Sourcebook for Banks, Building Societies and Investment Firms. Throughout the paper, we refer to all affected BIPRU firms as "banks" (i.e., firms that fall under the FSA/FCA Remuneration Code in the UK). For consistency, we continue to refer to the FSA as the main regulator behind the Remuneration Code.

Regulating compensation represents an additional mechanism over and above existing regulation to address managers' potentially strong incentives to take on risk that may not be socially optimal. Traditional banking regulation restricts financial institutions' decision-making by imposing financing and lending constraints. However, it does not impose a mechanism for ensuring that individuals at banks consider their decisions' negative externalities, some of which may take years to manifest. While bank executives' contracts might be perfectly aligned with the interest of shareholders (and hence be optimal from the private contracting point of view), they nonetheless might impose a suboptimal level of risk on society at large (Anginer et al. [2018]). Therefore, even in the absence of the principal-agent conflicts at financial institutions, there might still be room for regulation. The UK Remuneration Code's stated objective is to address the market failure resulting from negative externalities that individual banks do not take into account. That is, the Code seeks to link decision-makers' incentives to what the regulator deems to be a socially desirable outcome, such as increased financial stability and decreased systemic risk. In a speech several years after the implementation of the Remuneration Code, Mark Carney, the then Governor of the Bank of England, referred to the success of the Code in curbing incentives for risk-taking and improving incentives for effective risk management (Carney [2014]).

We start with cross-sectional comparisons of compensation contracts in the UK for the large UK FTSE 350 firms and UK banks and find that in line with the regulation, UK banks change compensation contracts more than other UK firms following the introduction of the UK Remuneration Code. We next examine the economic consequences of the new regulation, which covers the compensation of a broad set of employees who can affect the bank's riskiness, by studying the changes in systemic risk. We compare UK banks to other UK firms and other banks of similar size in the European Union and the US to isolate the effect of the regulation from that

of the macroeconomic environment at the time. We find that following the introduction of the UK Remuneration Code, despite an increase in the sensitivity and contribution to systemic risk in the UK by large UK firms and UK banks, this increase is lower for UK banks, consistent with the intent of the regulation. However, systemic risk comparisons of UK banks with matched US and EU banks produce mixed results.

To evaluate the concerns raised about potential unintended consequences, we examine whether there is a change in executive turnover behavior after the regulation. We first identify CEO turnover incidents. Next, we hand-collect information on each CEO's reason for leaving his or her post to determine whether terminations were voluntary (unforced) or not (forced). We focus our analysis on the likelihood of unforced turnover and find that it increases for UK bank CEOs in the post-2010 period, while other UK firm and US bank CEOs' likelihood of unforced turnover decreases in the same time period.

Our paper contributes to several streams of the literature. First, we establish that although there was an increase in the contribution and sensitivity to systemic risk by large firms and banks in the UK subsequent to introducing the new regulatory change affecting compensation contracts, this increase was lower for UK banks. Our evidence, therefore, sheds some light on whether compensation regulation, as a specific case of corporate governance regulation, could be used to address banks' contributions to systemic risk and financial stability (Acharya, Engle, and Richardson [2012], Adrian and Brunnermeier [2016], Anginer et al. [2018], Brownlees and Engle [2017]).

Second, our paper also contributes to the literature on the economic consequences of regulatory changes in corporate governance and, in particular, executive compensation. Although there is extensive literature on the effects of regulation in other domains, studies on compensation

regulation thus far have tended to focus on say-on-pay regulation (e.g., Cai and Walking [2011], Ferri and Maber [2013], Larcker, Ormazabal, and Taylor [2011]). In contrast to say-on-pay regulation, which allows shareholders to voice their private concerns about executive pay, we focus on the Remuneration Code, which imposes mandatory changes on compensation contracts. The Code was introduced in addition to the existing say-on-pay regulation in the UK. Therefore, although shareholders of UK firms (both banks and others) have had the opportunity to voice their concerns about executive compensation at individual firms via a say-on-pay vote since 2002, the Remuneration Code was introduced as an additional measure to regulate compensation in banks after the financial crisis to address what were deemed to be negative externalities imposed by banks on the financial system.

We acknowledge a limitation of our study: our findings may not be generalizable to other firms, given the economic and regulatory idiosyncrasies of the financial services sector. Although the regulation we examine is unique to the financial services sector and our results might not be generalizable beyond financial institutions, we argue that it is important to study financial institutions as they represent a large part of the economy and play a crucial role in overseeing the payments system, creating liquidity, and providing financing, all of which have implications for the performance of the economy overall. Despite focusing on the UK as the setting, our analyses could inform the ongoing regulation process globally, given the international interest and effort in regulating compensation.

The remainder of this paper is organized as follows. Section 2 discusses the evolution of the Remuneration Code. Section 3 discusses our motivation and related research. Section 4 describes our data and research design. Section 5 presents our findings, and Section 6 concludes.

2 The UK Remuneration Code

Toward the end of the financial crisis, the UK government requested a review of banks' corporate governance and the causes of the financial crisis, as well as recommendations for changes in regulation to improve the quality of the banking system. Lord Adair Turner, the chairman of the FSA at the time, conducted the review of the causes of the financial crisis, while Sir David Walker reviewed banks' corporate governance. In addition to raising various other concerns, both reviews recommended that compensation practices be changed.

Concurrent with the Turner and Walker reviews, the FSA issued a proposed Remuneration Code on February 26, 2009.[4] The Code, which came into effect on January 1, 2010,[5] requires remuneration policies to be consistent with "effective risk management."[6] As anticipated at the time of the adoption, the Code was revised, and the new version became effective on January 1, 2011. The Code was further changed in 2014 in response to the EU-wide Capital Directive (CRD4). From July 1, 2015, financial regulators introduced five codes (although the BIPRU code and the code applicable to dual-regulated financial institutions remained largely the same). In 2010, the Remuneration Code applied to the UK's 26 largest banks, building societies, and broker-dealers. Starting January 1, 2011, the Remuneration Code applied to all banks, building societies,

[4] The market reaction to the announcement of the proposal of the UK Remuneration Code for UK banks was 5.04% (positive and statistically significant). To the best of our knowledge, this was the first announcement of the Remuneration Code. It was potentially going to affect 40 to 50 UK banks whose names were never publicly released. We follow the conditions specified in the proposal to identify potential banks that would have been subject to this version of the code before its revision. For a subsample of these firms for which we can find CDS data, we observe that the average spread for the 5-year CDS contracts for banks was negative and statistically significant, suggesting that on average investors perceived the Remuneration Code to result in a decrease in default risk for UK banks. For parsimony, we provide a detailed list of events connected to the announcement and implementation of the Remuneration Code and market reaction to these events in the Internet Appendix, Table IA9.

[5] Chapter 19, titled "The Remuneration Code," was included in the Senior Management Arrangement, Systems and Controls (SYSC) sourcebook (FSA [2009b]).

[6] Section 2.1 of the Code states that "A firm must establish, implement, and maintain remuneration policies, procedures and practices that are consistent with and promote effective risk management" (FSA [2009b]).

investment banks, and firms covered by the Capital Adequacy Directive (UCITs, fund managers, broker-dealers, asset management firms, and some firms that engage in corporate finance, venture capital, the provision of financial advice and stockbrokers). The FSA refers to these firms collectively as "BIPRU" in the Remuneration Code. Approximately 2,750 firms fall within the broader scope of the regulation.[7]

Not all BIPRU firms are affected in the same way. In particular, the FSA defines three proportionality tiers with different regulatory requirements: Tiers 1 and 2 contain credit institutions and broker-dealers that engage in significant proprietary trading and investment banking activities and have assets over £50 billion (Tier 1) and between £15 billion and £50 billion (Tier 2). Tier 3 mainly consists of smaller banks and building societies (with total assets not exceeding £15 billion) and firms that may occasionally take overnight or short-term risks with their balance sheets. Tier 3 also contains firms that generate income from agency business without putting their balance sheets at risk. The FSA uses a proportionately approach with requirements for Tier 3 being less onerous than for Tiers 1 and 2. Firms in Tier 3, for instance, are not expected to have a remuneration committee or apply some of the more rigid elements of the remuneration rules.[8]

The main restrictions implemented by the Remuneration Code focused on addressing the externalities brought on by incentives to take on risk and increase profitability, which translated to higher bonuses for employees in good times and minimal losses in bad times (as bonuses are bounded at zero). This means the consequences of risk-taking were borne by society and long-

[7] For the full definition of the applicability of the Code, see for example the FSA/FCA revised website at https://www.fca.org.uk/firms/being-regulated/remuneration-codes and FSA [2010].

[8] See, for example, https://web.archive.org/web/20120302233645/http://www.fsa.gov.uk/about/what/international/remuneration/application; https://web.archive.org/web/20120403185133/http://fsahandbook.info/FSA/html/handbook/SYSC/19A/1 and https://webarchive.nationalarchives.gov.uk/20121004080024/http://www.fsa.gov.uk/static/pubs/guidance/fg12-19.pdf. Since we compare UK banks to other large UK companies and large US and EU banks, we focus on Tier 1 credit institutions subject to the Remuneration Code starting from its first introduction in 2009 (and affecting pay in 2010) in our analysis. As noted earlier, we label them as "banks" throughout the paper.

term shareholders and not by the individuals who had taken the risk. In particular, the Remuneration Code mentions explicitly that remuneration is a driver for excessive risk-taking and can have wider ramifications on society at large by decreasing financial stability and increasing systemic risk and the cost of bank failure resolution. The Remuneration Code required that at least 50% of bonuses must be deferred for at least three years and must have performance vesting conditions attached, therefore putting pay at risk.[9] Long-term incentive plans (LTIPs) were also required to have risk adjustments. These rules now apply to executives and employees in roles that affect the riskiness of the business, who receive more than 33% of total remuneration in variable pay, and whose total compensation exceeds £500,000. In other words, the Remuneration Code affects the compensation of a range of employees, not just the top-tier executives. Finally, the Remuneration Code also requires Compensation Committees to communicate with banks' risk functions and report to the financial regulator.

In the United States, the US Securities and Exchange Commission (SEC), together with the Federal Reserve and other financial sector regulators, jointly issued a proposal in April 2011 to require large and systemically important financial institutions (with total assets of more than $50 billion) to defer at least 50% of compensation as incentive-based pay as part of the Dodd-Frank Act (section 956). The agencies reissued a revised regulation for consultation in April 2016 that applied to a broader set of financial institutions. The revised proposal for US financial institutions is similar in spirit to the UK's: it requires the deferral and performance-based vesting of incentive compensation to discourage excessive risk-taking and encourage a longer-term focus.

[9] The FSA found that none of the banks that had deferrals in place prior to the introduction of the Remuneration Code required vesting conditions to be tied to future performance (FSA [2009a]).

Implementation of the amended regulation was expected to take place at the end of 2017 but has not yet been announced.[10]

3 Related research and motivation

Our objective is to study the economic consequences of executive pay regulation using UK regulatory change as our setting. Regulation might be warranted in response to market failure due to a mismatch between private and social benefits and costs (Demsetz [1968], Stigler [1971], Posner [1974]). In our setting, even if compensation contracts overcome the principal-agent problem and are optimally aligned with the interests of shareholders (private costs and benefits), they might still lead to socially excessive risk-taking because they do not internalize the costs of resolving potential bank failures (social costs and benefits). At least part of the cost of bank failures is borne by depositors and taxpayers and not executives or shareholders. Therefore, bank executives have little incentive to take this cost fully into account (Anginer et al. [2018]). Thus, if there is socially suboptimal risk-taking by banks and the regulation is successful, we expect it to curb risk-taking behavior and lower systemic risk.

The Remuneration Code mentions the market failure it seeks to address, focusing specifically on curbing risk-taking behavior of bank managers by changing the horizon of

[10] In the EU, in February 2013, the European Parliament, the European Commission and the European Council proposed a new rule that capped the ratio of variable and fixed pay at the one-to-one level, with some flexibility to increase the ratio to one-to-two if there was a supermajority shareholder approval ("EU bonus cap"). The cap applies to all EU banks operating in the EU (including their employees based outside of the EU) and to non-EU banks operating in the EU. It became effective on January 1, 2014, and applied to bonuses paid in 2014 that related to performance in 2014. The EU bonus cap rules cover all financial institutions subject to the European Capital Directive (CRD4), including UK banks (see "MEPs Cap Bankers' Bonuses and Step up Bank Capital Requirements," *European Parliament Press Release*, February 28, 2013, available at http://www.europarl.europa.eu/news/en/press-room/20130225IPR06048/meps-cap-bankers-bonuses-and-step-up-bank-capital-requirements). We stop our sample period in 2012 to avoid introducing any confounding effects on our comparisons due to the evolving regulatory landscape in our comparison countries. Although we do not present these results in the paper for parsimony, we tabulate the market reactions to these announcements in our Internet Appendix, Table IA9, for the interested reader. For a discussion on the effects of the EU bonus caps on bank risk and performance, please see Cotonnello, Koetter and Wagner [2020].

compensation, introducing risk-adjusted incentive-based pay, and reducing cash-based compensation:

> "The interests of shareholders with a focus on short-term profits are not aligned with those of long-term shareholders. They are further not aligned with the interests of society as a whole, as they do not take into account the wider consequences of excessive risk-taking. Shareholders with a focus on short-term profits can include employees of the firm who are participants in share incentive schemes, which often mature in a relatively short period of time. Pressure from shareholders with short-term perspectives is one factor why remuneration packages geared towards the short-term and leading to excessive risk-taking are offered to employees in the banking industry." (Financial Services Authority [2009a, p.23])

Introducing regulation is not costless, however. While regulation that addresses a market failure could potentially lead to a socially preferable outcome, it can also have unintended consequences for banks and the economy at large, such as loss of talent and inefficient changes to banks' asset portfolios if complying with the regulation means that firms would have to move away from their optimal compensation structures (Core and Guay [2010], Murphy [2013]).[11,12]

Prior studies find that banks with shareholder-friendly corporate governance contribute more to systemic risk and have incentives to shift the risk of bank failure from shareholders to taxpayers (Anginer et al. [2018], Thanassoulis and Tanaka [2018]). For large and systemically important banks, Thanassoulis and Tanaka [2018] show analytically that clawback rules and linking pay to interest rates result in executives making socially optimal risk-taking choices if they are accompanied by restrictions on the curvature of compensation (which they suggest could be achieved through equity options and promotion policy).

[11] We assume that since the Remuneration Code was introduced, the UK regulator must have expected the social economic benefits to outweigh the social economic costs.

[12] Given data availability constraints, we focus on the loss of talent as an unintended consequence. Unfortunately, the data on detailed portfolio composition for UK and other EU banks is not available until the initiation of stress tests in 2009. Therefore, we are unable to examine whether there were any inefficient changes in asset portfolios in response to this regulation.

Our paper differs from prior literature on compensation. We provide empirical evidence on the consequences of the actual implementation of the regulation, unlike studies such as Bebchuk and Spamann [2010] and Bhagat and Romano [2010], which criticize existing pay practices and propose a reform in executive compensation, or Core and Guay [2010] and Murphy [2013], which provide an *ex ante* analysis of proposed compensation regulation. Even though our findings are specific to the banking sector in the UK, our evidence is important, given the banking sector's interconnectedness with the economy as a whole. Our study, with its focus on the consequences of the Remuneration Code, is also different from the literature on the say-on-pay regulation (e.g., Ferri and Maber [2013], Larcker et al. [2011]). This is because the Remuneration Code focuses on addressing the negative externalities imposed by banks' risk-taking behavior, whereas say-on-pay regulation is about resolving agency conflicts between managers and shareholders. Furthermore, compliance with the regulation we study is mandatory, which means that UK banks must have compensation practices that comply with the Code, an important difference from the say-on-pay setting. Although firms are required to take a vote in a say-on-pay setting, these votes are non-binding, meaning that firms are not required to make changes to their compensation practices to address shareholders' concerns.

4 Data and research design

4.1 Sample selection and description

Our treatment sample consists of UK banks defined as Tier 1 credit institutions subject to the dual regulation by the Bank of England and the FSA. As discussed above, Tier 1 consists of large banks, building societies, and investment management firms subject to UK prudential regulation. These UK Tier 1 credit institutions were subject to the Remuneration Code starting from its first

introduction in 2009 (affecting pay in 2010). Since regulation is typically introduced in response to an event that is taken to indicate a market failure, it might not be considered a truly exogenous shock. An ideal control group for our study would have been a set of banks that are similar to UK banks and are exposed to the same regulatory regime and macroeconomic conditions but are not subject to the UK Remuneration Code. Since all comparable banks in the UK are subject to the Remuneration Code, we are unable to use the ideal control group. Instead, we use three different control groups and highlight their shortcomings. We compare UK banks to other UK companies in the UK FTSE350 index and matched US and EU banks.

First, we compare UK banks to other UK firms as both groups are subject to the same macroeconomic conditions. The disadvantage of this control group is that the firms are in different sectors. Second, we compare the UK banks subject to the Remuneration Code to comparable banks in the US and EU that are not affected by the UK Remuneration Code. These two control groups (US and EU banks) are expected to have been affected by similar industry-specific changes, but the disadvantage is that they are in different jurisdictions. These countries have also been subject to evolving compensation regulations. We stop our sample in 2012 so that our comparisons with these countries are not confounded by their regulation changes.[13] As US and EU banks are larger than the group of UK financial institutions that are required to follow the Remuneration Code in the second wave (i.e., starting January 1, 2011), we cannot find any suitable matches for this set

[13] One might be concerned that following the financial crisis, other regulatory changes addressing banks' contributions and sensitivity to systemic risk would have also played a role. However, these other regulatory changes such as those to capital and liquidity requirements through the EU-wide capital directives were announced in 2013 but did not come into force until 2014. For example, the EU-wide Capital Requirements Directive (CRD IV) implemented Basel III capital requirements. These capital requirements came into force on January 1, 2014. The introduction of CRD IV potentially affects bank-specific outcomes as well as the measures of systemic risk. CRD IV also implemented EU-wide bonus caps, which apply to the UK banks in our sample as well as to our control sample of other EU banks. In addition, the US introduced the Dodd-Frank Act in July 2010 with implementation starting in 2011. We stop our sample period in 2012 in order to avoid any contamination from these regulatory changes.

of UK financial institutions. This is why we cannot implement tests based on the staggered adoption of the regulation.

Table 1, Panels A and B show our sample construction based on our main data sources for our three main samples. For all of our samples, we exclude the observations for years in which CEOs' contracts are terminated or started (we call these "partial years"), as compensation contracts during these periods might include additional features that would not be observed during regular tenure years.[14] Panel A presents the sample construction starting from all available data and implements filters for CEOs and partial years. We also show the final number of observations for EU and US banks after implementing propensity score matching. Panel B of Table 1 presents our sample by showing the number of unique firms and the corresponding firm-year observations. We also provide the same details in the notes to all of our tables.

As the regulation of executive compensation focuses on banks, we split our sample into firms that fall under the UK Remuneration Code regulation (UK banks) and other firms. We have 110 firm-year observations for UK banks and 1,429 firm-year observations for other large UK firms in the UK sample.[15] As we rely on compensation data for some of our analyses, our sample is based on the most complete data we can obtain for all of our variables of interest, including compensation and turnover-specific variables. Our final UK sample consists of 1,539 CEO-year observations from 2006 to 2012. Table 1, Panel A presents our sample construction based on various sources.

[14] In our analysis of CEO turnover, however, we retain the partial year observations to identify instances of turnover.
[15] The Remuneration Code is in effect for all UK BIPRU firms that are FSA regulated. To evaluate the sensitivity of our results to our sample composition, we collected data on UK banks and financial institutions that do not belong to FTSE 350 via Capital IQ, where available. Not surprisingly, total compensation and its components for those firms are lower than the respective values for the group of FTSE 350 UK banks. Although inclusion of the non-FTSE 350 firms results in reduced differences between banks and non-banks, our inferences from multivariate analyses remain unchanged.

Using propensity score matching, we construct a matched sample of EU and US banks using total assets, profitability (return on assets), and bank leverage as our observable characteristics. We use a one-to-one nearest neighbor matching without replacement. The final matched sample consists of 110 UK bank-, 66 EU bank- and 116 US bank-year observations (Table 1).[16] We convert all currency-denominated amounts into real UK pound sterling using 2012 as our index year.

Our data comes from several sources. We compute measures of systemic risk using Datastream, FactSet, and macroeconomic data from the Bank of England, Eurostat, and the US Federal Reserve Bank of St. Louis FRED databases. For bank-specific measures of systemic risk, we also obtain SRISK (expected capital shortfall) and LRMES (long-run marginal expected shortfall) directly from the New York University Stern School of Business Volatility Institute's Volatility Laboratory (VLab).[17] Since VLab computes these measures for large and systemically important financial institutions, we only have these variables for a subset of UK banks, US and EU banks. For our compensation measures, we also obtain CEO compensation data for the UK FTSE 350 firms trading on the London Stock Exchange Main Market from Thomson Reuters IDS and Compustat Capital IQ.[18] For a subset of firms for which data is available, we also collect credit default swap (CDS) data from Markit. We supplement this data with market and accounting

[16] Three US banks that were selected as matches to UK banks in the pre-2010 period were no longer considered the nearest neighbor matches to those UK banks in the post period. We retain these US bank observations to avoid introducing confounding effects across time due to our sample composition. This is why we have more US bank-year observations than our UK bank-year observations. We match banks annually on these observable characteristics. In untabulated robustness results, we also reconstruct our sample with a one-off match from the start of the sample and obtain similar results.

[17] See the Volatility Laboratory of the NYU Stern Volatility Institute (https://vlab.stern.nyu.edu) and Appendix C for more information.

[18] Although the scope of the regulation we study extends beyond the CEOs, we constrain our analysis to CEOs to facilitate comparability across our test sample and control samples. IDS collects compensation and incentives data from companies' annual remuneration reports and the resulting data contains information on components of executive compensation and their contractual features. Our dataset from IDS spans the period of 2006 to 2012 and provides information for 2,470 unique executives from 532 firms.

information from Thomson Reuters Datastream, Capital IQ, and Compustat Global. Bank-specific data for the UK, other EU, and US banks is from Bankscope. We provide additional details on our variable construction in Appendix A. We also note that our sample size is relatively small for bank-specific comparisons and we have limited data available for some of our proxies, therefore, limiting the power of our tests.

4.2 Changes in compensation after the Remuneration Code

In this section, we describe the changes we observe in CEO compensation at UK banks after the implementation of the Remuneration Code. We conduct univariate difference-in-difference comparisons of individual contractual features across UK banks and other FTSE 350 firms.[19] Table 2 presents these comparisons. As IDS data provides details for option-based compensation only from 2007, and we require two years of data to compute changes in contractual features, our pre-period sample is limited to 2008-2009. Our post Remuneration Code period is 2010-2012. We find that salaries and take-home pay for UK banks are significantly higher in the pre- and post-period compared to other UK firms. However, the proportion of salary in total compensation at banks decreases in the post-2010 period while the percentage of incentive pay increases significantly. UK banks increase the number of option schemes and the shareholding requirements more than other UK firms post-2010.

Before the regulation, all UK banks had a bonus scheme in place. However, it appears that some firms stopped paying bonuses after the Remuneration Code became effective.[20] As mandated

[19] We review financial and proxy statements for US and EU banks in our sample as well as ISS data for the US to determine if we can compare compensation packages across these samples. From our review of financial statements and the ISS data for US banks, we find that the presentation of data for targets and vesting periods is different enough that comparisons would be difficult. Furthermore, US banks defer bonus compensation entirely voluntarily without any targets or vesting period requirements. We therefore focus on the UK for this comparison, where presentation of compensation packages is comparable across firms.

[20] We recognize that this might be an outcome of other confounding events such as the LIBOR scandal, however.

by the regulation, the percentage of deferred bonus to total compensation increases significantly for UK banks. All UK banks have a mandatory deferral policy in the post-2010 period in line with the regulation, while only 73% of other large UK firms do. Another important requirement of the Remuneration Code is the performance-based vesting of deferred bonuses.[21]

Table 2 also shows that the total number of unique performance targets for UK banks decreases on average compared to other large UK firms and that this decrease comes from the number of bonus targets. This is consistent with the argument that to evaluate performance and meet targets, the number of targets must be manageable and consistent (Kole [1997]). To capture the overall changes in compensation contracts, we compute the *Number of Contract Changes (weighted)* for our UK sample. It is defined as the number of contractual features that change in a given component of compensation scaled by the number of contractual features present in that component at the beginning of the year, summed across the components with weights applied as the proportion the corresponding compensation component represents in total pay. Since this measure contains the abovementioned weights, it captures not only the existence of changes in compensation contracts but also their materiality. As Table 2 shows, before the introduction of the Remuneration Code, UK banks had fewer material contractual changes than other UK firms did. However, following the introduction of the Remuneration Code, UK banks show more material contract changes. This finding is consistent with UK banks making changes to their compensation contracts because of the implementation of the Remuneration Code.

[21] In the Internet Appendix, Table IA2, we show using multivariate regressions of determinants of compensation that deferred bonus is the main component of total compensation that changed in the post-2010 period for UK banks. We also find that the increase in deferred bonuses observed in UK banks in the post-2010 period is higher than the changes observed by US and EU banks.

5 Results

5.1 Effects of the Remuneration Code on systemic risk

We begin our analyses by first examining whether the Remuneration Code successfully reduced systemic risk at affected financial institutions in the UK. We expect this broad economic consequence because the scope of the regulation includes a wide-ranging set of financial sector employees who have the potential to influence the risk profile of their employers, as discussed above. We utilize several measures of systemic risk, namely 1) *ΔCoVaR*, defined as a change in the value at risk (*VaR*) of the financial system conditional on an institution being under distress relative to its mean state (Adrian and Brunnermeier [2016], Bushman and Williams [2015]; 2) long-run marginal expected shortfall (*LRMES*), which measures how much capital an institution needs to have to withstand a systemic event (Acharya et al. [2017], Brownlees and Engle [2017]); and 3) the expected capital shortfall (*SRISK*) defined as the expected capital shortfall of a financial entity conditional on a prolonged market decline (Brownlees and Engle [2017]). In our analyses, we control for firm and bank characteristics that have been identified as covariates of systemic risk, namely size ($Log(Sales)_{t-1}$), growth opportunities ($Book\ to\ market_{t-1}$), and leverage ($Leverage_{t-1}$). We define *Sales* for financial institutions as a top-level revenue number (consisting of gross interest and other income), which is equivalent to sales for a non-financial firm.

We compute the *ΔCoVaR* measure following the methodology outlined in Adrian and Brunnermeier [2016] using quantile regressions and publicly available data for our sample of UK banks and other large UK firms, US banks, and EU banks. We compute two measures of *ΔCoVaR*: bank i's contribution to the overall systemic risk ($\Delta CoVaR_{99\%,t}^{system|i}$) and bank i's sensitivity to the overall systemic risk ($\Delta CoVaR_{99\%,t}^{i|system}$). These measures are computed one period forward. Adrian and Brunnermeier [2016] highlight that rather than using a bank's risk in isolation, which is

typically measured by its value at risk (*VaR*), regulators should also include a bank's contribution to systemic risk as measured by the *ΔCoVaR*.

VaR measures the worst expected loss over a specific time interval at a given confidence level and is, by definition, negative. Following Adrian and Brunnermeier [2016], we do not flip the sign, and, therefore, a more negative value of either *VaR* or *ΔCoVaR* represents a higher contribution or sensitivity to systemic risk. We define systemic events as being the 1% quantile of weekly asset returns and losses when measuring these variables.[22] Following Bushman and Williams [2015], we convert our weekly estimates to annualized figures using averages.

Given that Adrian and Brunnermeier [2016] study systemic risk for the financial sector and the *ΔCoVaR* and VaR measures that we use in our paper rely on their paper, it may therefore be more natural to think of these measures in the context of the financial sector. However, *ΔCoVaR* captures value at risk measured as equity returns conditional on changes in various macro state variables. Therefore, it is possible to compute it for non-financial companies. *ΔCoVaR* for non-financial firms reflects how sensitive these non-financial firms' values are to the changes in macro state variables, which capture economy-wide changes during times of market stress. Intuitively, *ΔCoVaR* for non-financial firms would therefore capture systemic risk in the real economy. In addition, we are not the first to use measures of *ΔCoVaR* as proxies for economy-wide systemic risk. For example, Anginer et al. [2018] compare financial institutions in different countries to the non-financial sector using the same measures. Large businesses have sufficient connections to the market as a whole through their wide-ranging transactions with multiple factors of production;

[22] We provide the full details of our estimation for our systemic risk variables in Appendix C.

therefore, they are relevant for macroeconomic stability.[23] In our main tests using this measure, we focus on the largest UK firms based on their asset size to identify their potential importance in the contribution to the overall systemic risk in the UK, acknowledging their importance for the UK economy as a whole.

Table 3 presents summary statistics for our main variables and sample. Panel A contains the subsample of UK banks, Panel B includes all other UK firms, and Panels C and D show the information for US and EU banks from the matched sample, respectively. Detailed definitions of all variables used in our analysis are in Appendix A. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1st and 99th percentile of their respective distributions in each year.[24] As can be seen from Panel A of Table 3, UK banks' contribution and sensitivity to systemic risk, as well as idiosyncratic and total volatility, and leverage decreased following the introduction of the Remuneration Code. Systemic risk and sensitivity to systemic risk for other large UK firms (Panel B of Table 3) also appear to decrease univariately. Panel C of Table 3 shows similar patterns for matched US banks. Panel D, however, shows that the average value of EU banks' contribution to system risk is higher, albeit their sensitivity to aggregate risk is lower. Their average idiosyncratic and total volatility is higher.

Table 4 presents our main findings for systemic risk. Panel A compares large UK banks with other large UK firms (measured as the top 10 by asset size in a given year).[25] As the

[23] The bailout of GM during the financial crisis is a good example. According to a research report by the Center for Automotive Research, the bailout of GM helped avoid the loss of 1.2 billion jobs in 2009, and $129.2 billion in personal income in 2009 and 2010 (see http://www.cargroup.org/wp-content/uploads/2017/02/The-Effect-on-the-US-Economy-of-the-Succesful-Restructuring-of-General-Motors.pdf).

[24] We also note that our results are not sensitive to trimming our variables instead of using winsorization. Given the relatively small sample size of our regulated firms, we choose to use the winsorized sample to maximize our sample size.

[25] We present the comparison to the full sample of other UK firms as well as the matched EU and US banks in the Internet Appendix, Table IA3.

coefficient for *UK bank* shows, on average, UK banks contribute more to systemic risk in the UK (column 1) and are more sensitive to systemic risk (column 2) before 2010.[26] UK banks are also riskier than the comparable largest UK firms (column 3) before the introduction of the UK Remuneration Code. Following the introduction of the Remuneration Code in 2010, the contribution of both UK banks and the other large UK firms to UK systemic risk increases. However, the increase in the UK banks' contribution to UK systemic risk is lower than that by other large UK firms (the coefficient on the interaction term *UK bank x Post 2010* in column 1 is positive and statistically significant). We also observe that UK banks' and other large UK firms' sensitivity to systemic risk increases after 2010. Nevertheless, the increase observed for UK banks is lower than that observed for other large UK firms (column 2). Furthermore, while other large UK firms became riskier post-2010, UK banks became less risky following the introduction of the Remuneration Code (column 3).[27]

Next, we compare the largest UK banks to the largest US and other EU banks. We focus on the largest banks (measured as the top 10 by asset size in our subsample of matched banks) as they are the most similar to the largest UK banks. Panel B of Table 4 presents our findings for UK banks relative to the largest US banks. On average, compared to this set of banks, UK banks contribute more to systemic risk but are less sensitive to systemic risk events before 2010 (the coefficient on *UK bank*, columns 1 and 2, respectively). Following the introduction of the UK Remuneration Code, the contributions of both UK banks and US banks to their respective systemic risks increase; however, the increase in UK banks' contributions to UK systemic risk is

[26] Recall that by construction of our *ΔCoVaR and VaR* measures, the more negative the coefficient is, the higher the contribution and sensitivity to systemic risk. Conversely, a positive coefficient implies a lower contribution to systemic risk or a lower sensitivity.

[27] When we do the full sample comparison rather than focusing on just the largest firms, we find consistent results for the coefficient on the interaction term *UK bank x Post 2010.* See the Internet Appendix, Table IA3, Panel A for more details.

significantly lower than the increase in comparable US banks' contributions to US systemic risk (see the coefficient for *UK bank x Post 2010* in column 1). We observe an increase in the sensitivity to systemic risk for US banks after 2010 (as indicated by the *Post 2010* coefficient); however, UK banks' sensitivity to systemic risk does not change differentially (see the interaction term *UK bank x Post 2010* in column 2). UK banks are also relatively riskier than US banks before 2010 (column 3, *UK bank*); however, following the introduction of the Remuneration Code, we do not observe a significantly different change for UK banks relative to US banks (the coefficient on the interaction term is insignificant). Likewise, for Long-Run Marginal Expected Shortfall (LRMES, column 4) and the overall systemic risk contribution relative to the banking system (SRISK, column 5), we do not find statistically significant changes for UK banks relative to US banks.[28]

In Panel C of Table 4, we compare the systemic risk results for UK banks and other large EU banks. On average, compared to the largest EU banks' contribution and sensitivity to EU systemic risk, UK banks have a higher contribution (column 1, *UK bank*) but less sensitivity to systemic risk in the UK (column 2, *UK bank*) pre-2010. Following the introduction of the Remuneration Code, we do not find any incremental change, as captured by the insignificant interaction term. Although for large EU banks, *VaR* (column 3) increases post-2010, we do not observe a statistically different change for UK banks. For LRMES, we find that the required capital shortfall (column 4) increases for EU banks (the coefficient on *Post 2010* is positive and significant). The coefficient on *UK x Post 2010* is negative and significant and is of the same magnitude as that for *Post 2010*, indicating no significant change for UK banks after the

[28] When we do the full sample comparison rather than focusing on just the largest banks, we find mixed results. We find that in this sample, UK banks' contribution to UK systemic risk and their own risk (columns 1 and 3) increases more than that observed for US banks, whereas their sensitivity to UK systemic risk does not increase as much as the US banks sensitivity to US systemic risk post-2010 (column 2). Similar to our main results, LRMES and SRISK do not yield any significant results. See the Internet Appendix, Table IA3, Panel B for more details.

implementation of the UK Remuneration 2010. Finally, while the largest UK banks appear to require less capital on average than other EU banks before 2010, they do not exhibit a statistically different change after the introduction of the Remuneration Code (column 5).[29]

One concern for the difference-in-difference analyses is that treatment and control firms might follow different trends before the treatment. Therefore, we show our tests for parallel trends in the Internet Appendix, Table IA4, corresponding to our main analyses for systemic risk discussed above. Panel A shows a significant change following the implementation of the Remuneration Code and that the parallel trend assumption holds in our UK sample. For the comparison of UK banks with US banks (Panel B), however, we observe a divergence in trends between US largest banks and UK banks before the implementation of the UK Remuneration Code. In particular, UK banks appear to contribute more to the UK systemic risk than US banks do to the US systemic risk before the implementation of the UK Remuneration Code. It is possible that this could have encouraged the UK financial sector regulators to intervene and develop the Remuneration Code. Finally, Table IA4, Panel C, shows no statistically significant differences between trends for UK banks and other EU banks, except for column (2). However, the interaction coefficient in our main result in Table 5, Panel C, column (2) is insignificant.

In additional analyses for a subsample of the largest 10 UK banks and other UK firms by asset size, we test whether there is cross-sectional variation in the systemic risk results presented above. In particular, we examine whether changes in compensation contracts observed at UK banks after the implementation of the Remuneration Code are associated with our proxies of systemic risk. Internet Appendix Table IA5, Panel A shows that contractual changes, measured

[29] When we do the full sample comparison rather than focusing on just the largest banks, we find more significant results. In this sample, UK banks' sensitivity to UK systemic risk, their own risk and SRISK (columns 2, 3 and 5) decreases more than that observed for EU banks after 2010, whereas results for contribution to systemic risk and LRMES are insignificant. See the Internet Appendix, Table IA3, Panel C for more details.

using the *Number of contract changes (weighted)*, provide incremental explanatory power for the reduction in the largest UK banks' contribution and sensitivity to systemic risk following the introduction of the Remuneration Code. We also find that an increase in the number of contract changes following the introduction of the Remuneration Code results in a higher increase in own risk (as measured by *VaR*) for the largest UK banks relative to the largest other UK firms.[30] Furthermore, our results for contribution to systemic risk (column 1) and own risk (column 3) are not sensitive to our choice of the measure of changes in compensation contract (Internet Appendix, Table IA5, Panels C and D).

5.2 Effects of the Remuneration Code on risk-taking

One of the main aims of the Remuneration Code was to change the horizon of incentives by requiring bonus deferrals and performance-based vesting of deferred compensation to decrease excessive and short-term risk-taking activities. Our results show some evidence that the Remuneration Code was successful in reducing banks' contributions and sensitivity to systemic risk in the UK. We next examine the incremental impact of the UK Remuneration Code on proxies of firm-level risk-taking to explore if these proxies help us identify a channel through which the reduction in systemic risk is achieved. In Table 5, Panel A, where we compare UK banks with other UK firms, we test the effects of the Remuneration Code on risk-taking using three general proxies of risk: (1) *Idiosyncratic Volatility*, which measures firm-specific risk, (2) *Total Volatility*, which measures the overall risk exposure, and (3) *Leverage*. We also measure default risk using

[30] In the full sample (Internet Appendix, Table IA5, Panel B), we find that the number of contract changes provide additional explanatory power for the reduction in the UK banks' contributions to systemic risk relative to other firms post-2010 (column 1). However, we do not find that the number of contractual changes have a statistically significant impact on UK banks' own sensitivity to systemic risk relative to other UK firms after 2010 (column 2). We also find that UK banks' value at risk decreases less for UK banks with more contractual changes after the implementation of the Remuneration Code (column 3).

two proxies: (1) *Z-score* and (2) *CDS spreads*. The *Z-score* measures the closeness of a firm and, in particular, a financial institution to its default barrier as it considers both performance (ROA) and the share of book equity in total assets (Equity/Assets or capital ratio for banks). For example, this measure is used in a cross-country setting by Laeven and Levine [2009], who study the impact of corporate governance on banks' risk-taking behavior. This measure represents an inverse of the probability of insolvency, where a higher *Z-score* implies a lower risk of default and, therefore, greater stability.[31] For a subsample of our observations, for which we have CDS spread data from Markit, we also study changes in average 5-year CDS spreads following the introduction of the Remuneration Code.

Table 3 presents summary statistics for the main variables used in these analyses and breaks down the sample between pre-and post-2010. In particular, Panel A of Table 3 shows that UK banks have lower idiosyncratic and total volatility but higher levels of default risk using the accounting measure of default (*Z-score*) and the market measure of CDS spreads after the introduction of the UK Remuneration Code. We compare other UK firms, US banks, and EU banks to UK banks in other panels of Table 3. Panel B of Table 3 shows that other UK firms also, on average, have lower idiosyncratic risk and total volatility and higher average values of default risk post-2010. Compared to UK banks, other UK firms have lower idiosyncratic risk, lower total volatility, and statistically similar default risk. Panel C shows that US banks have lower idiosyncratic and total volatility, lower default risk based on the *Z-score* but higher levels of default risk based on CDS spreads post-2010. Compared to UK banks, US banks have higher idiosyncratic and total volatility but lower default risk after 2010. Panel D shows that the proxies for risk increase for EU banks post-2010. Compared to UK banks, EU banks appear to have statistically similar

[31] The original measure uses the standard deviation of ROA as a scaler; however, given our smaller sample and horizon, we substitute it by the total volatility of returns.

idiosyncratic risk, higher average total volatility, and lower default risk (based on *Z-score*) after 2010.

We present our main results using the same set of control variables as before. In untabulated robustness tests, we also add additional control variables used in prior studies as determinants of CDS spreads and find similar results. In Table 5, Panel A, we find that, on average, UK banks have lower total volatility (column 2) and higher leverage (column 3) before 2010. We also observe that the first three measures of risk are lower post-2010 for other UK firms. While idiosyncratic risk and total volatility for UK banks' do not change differentially post-2010, their leverage decreases significantly more relative to other UK firms following the introduction of the Remuneration Code (the interaction coefficient in column 3). When we consider proxies of default risk, we find mixed results. On one hand, relative to other UK firms, UK banks, on average, have a lower risk of default before the implementation of the Code (as measured by a positive and significant coefficient in column 4 for the Z-score). However, the coefficient on the interaction term for default risk score is negative and significant, indicating an increase in UK banks' default risk relative to other UK firms post-2010. On the other hand, we find that relative to other UK firms, the CDS spreads for UK banks decrease by approximately 10 basis points post-2010. Given a 10 basis points increase for other UK firms during the same time (as captured by the coefficient on *Post 2010*), the aforementioned relative decrease for UK banks implies a negligible change for this group post-2010 (column 5).

Table 5, Panels B and C present bank-specific measures of risk-taking for the subsample of UK banks matched to US and EU banks, respectively. In Panel B, we find that, on average, pre-2010, UK banks appear to take more risk relative to US banks based on the three out of eight statistically significant proxies (namely, leverage ratio, commercial and industrial loans (C&I),

and non-performing loans (NPL)). However, we observe no incremental changes for these three proxies for UK banks relative to US banks following the introduction of the Remuneration Code. The default risk for US banks declines after 2010 (column 7). However, UK banks demonstrate an increase in default risk in the same time period. The only proxy, which appears to suggest some reduction in risk-taking by UK banks relative to US banks after 2010, is the regulatory capital (Tier 1 ratio).

Panel C shows that compared to EU banks, on average, UK banks have higher leverage and higher default risk before 2010 (columns 1 and 7). However, on average, they also have higher quality asset portfolios (column 2) before 2010. Following the introduction of the Remuneration Code, we observe only one weakly statistically significant change for UK banks relative to matched EU banks, and that is in the proportion of C&I loans. These loans are typically considered riskier as they are not collateralized. Therefore, this result indicates an increase in risk-taking by UK banks relative to EU banks, which is counter to the intent of the Remuneration Code. In summary, seven out of eight proxies of risk-taking fail to detect statistically significant changes in risk-taking activities for UK banks relative to EU banks following the introduction of the UK Remuneration Code. Given data availability constraints for bank-specific risk-taking proxies (see Table 3), we have even smaller sample sizes in Panels B and C of Table 5. We, therefore, recommend the reader exercise caution when interpreting these results.

In additional cross-sectional analyses for our UK sample, we test whether there is any variation in the risk-taking results discussed above. In particular, we examine whether the changes in compensation contracts observed at UK banks after the implementation of the Remuneration Code are associated with our proxies of risk-taking. We find that contractual changes, measured using the *Number of Changes (weighted),* are negatively associated with our total and idiosyncratic

volatility risk measures, suggesting that changes in contracts decrease UK banks CEOs' risk-taking incentives relative to CEOs in other UK firms subsequent to the introduction of the UK Remuneration Code. The analyses using the remaining three proxies of risk-taking as dependent variables do not yield significant results for the *Number of Changes (weighted)* for UK banks post-2010. Overall, we interpret these findings as providing some support for the role of contractual changes in decreasing risk-taking. We present these results in the Internet Appendix, Table IA6.

Although we do not find consistent results indicating reduced risk-taking by UK banks with the majority of our proxies, our cross-sectional evidence for the UK establishes a partial channel connecting the results from risk-taking and systemic risk analyses in two steps. First, we find that more material changes in compensation contracts after the implementation of the Remuneration Code incrementally reduce UK banks' total and idiosyncratic volatility. Second, these two firm-specific market-based measures of risk play a role in determining market-wide volatility, thereby affecting systemic risk proxies. These two steps combined allow us to connect the observed contractual changes to a reduction in risk-taking and, therefore, to systemic risk in the UK. This is consistent with the Remuneration Code having some effect on risk-taking due to the required changes to compensation contracts, thus, leading to an incremental reduction in UK banks' contribution and sensitivity to UK systemic risk.

5.3 Effects of the Remuneration Code on the sensitivity of equity-based compensation to risk-taking incentives

Given the intent of the Remuneration Code is to reduce excessive risk-taking, in this section, we study whether its introduction affects the sensitivity of equity-based compensation to volatility (*Vega)*, a common measure of risk-taking incentives embedded in compensation contracts (Core and Guay [2002]). As financial institutions are highly levered, the convexity typically observed in

Vega is also present in shares of stock, and therefore the value of CEOs' equity holdings and equity incentives (*Wealth*) in a given year potentially provides additional risk-taking incentives.[32]

We hand-collect data on stock ownership, options, and vesting schedules from financial disclosures and FactSet to compute *Vega* based on Core and Guay [1999], [2002] and *Wealth*. Table 3 presents summary statistics for these variables for the two subsamples before and after the introduction of the UK Remuneration Code in 2010. Panel A shows that for UK banks, CEOs' vega and wealth increase on average following the introduction of the Remuneration Code. We observe similar changes to other UK firms (Panel B). However, US banks appear to see a decline in the average values of vega between pre and post-2010 periods and an increase in CEO wealth (Panel C). Panel D of Table 3 shows that EU banks have relatively low values of vega that increase after 2010. We also note a positive change in shareholder wealth after 2010 for EU banks.

We present our multivariate findings in Table 6. Panel A shows the results comparing UK banks to other UK firms. Column (1) gives the results for CEOs' compensation *Vega* and column (2) presents the results for the total value of CEOs' *Wealth* (we use natural logarithms for both measures). We find that, on average, the compensation of UK bank CEOs has a higher sensitivity to stock return volatility, and these CEOs have lower overall wealth compared to CEOs at other UK firms before 2010. We find that the sensitivity of CEO compensation to volatility at UK banks increases following the introduction of the UK Remuneration Code in 2010 relative to other UK firms. For our wealth measure, we find that compared to other UK firms, following the introduction of the Remuneration Code, UK banks' CEOs observe an incremental increase.[33] We attribute the

[32] The differences in leverage between UK banks and other UK firms is partially alleviated by including industry fixed effects in our UK tests. Comparison across banks in different jurisdictions takes into account highly-levered nature of financial institutions.

[33] In addition, in untabulated results, we investigate the impact of the Remuneration Code on CEOs' shareholdings as a percentage of total shares outstanding, market value of CEO equity holdings (excluding options and LTIPs), and market value of CEO equity holdings relative to total compensation and find similar results obtained with our wealth measure.

increased sensitivity to volatility to the increased shareholding requirements and more non-cash bonus compensation, as we observed in Table 2.

In Panel B of Table 6, we present similar tests comparing the sensitivity of equity-based pay to volatility for UK bank CEOs compared to their counterparts at similar US banks. We find that, on average, UK banks' CEOs have lower *Vega* and lower *Wealth* before 2010. We also observe that UK bank CEOs' compensation sensitivity to stock return volatility (*Vega*) increases following the introduction of the Remuneration Code relative to US bank CEOs. UK bank CEOs' wealth also increases post-2010. Next, in Panel C of Table 6, we compare UK bank CEOs to their EU counterparts and find that the former have a significantly higher sensitivity to stock return volatility (column 1) but not higher overall wealth (column 2) pre-2010. However, we also find that these sensitivities do not change incrementally for UK banks following the introduction of the Remuneration Code.

Although at face value, our findings in Table 6 with respect to *Vega* and *Wealth* seem to contradict the intent of the Remuneration Code, these observed changes could be driven by increased shareholding requirements and the introduction of more option schemes subsequent to the Remuneration Code (as we observe in Table 2). Even though the Remuneration Code did not introduce any specific constraints for shareholding requirements and option schemes (unlike the restrictions it brought for bonuses), the guidelines suggest that these components of variable pay need to be in line with curbing risk-taking incentives. To the extent that option schemes and shareholding requirements have performance-vesting conditions, they can still discourage excessive risk-taking and encourage a longer-horizon focus. Unfortunately, we cannot measure these performance-vesting conditions directly.

In further cross-sectional tests for the UK sample, we find that, after the Remuneration Code, for UK banks relative to other UK firms, the number of contract changes (*Number of Contract Changes (weighted)*) is negatively associated with *Vega* and *Wealth*. The contractual changes following the introduction of the Remuneration Code suggest that UK banks adapt their compensation contracts according to the Code requirements. More pronounced changes in *Vega* and *Wealth* for banks with a higher number of contract changes suggest that the Remuneration Code has an impact on risk-taking incentives through these contractual changes to compensation. Therefore, this cross-sectional evidence allows us to connect changes in risk-taking incentives (*Vega* and *Wealth*) in the post-2010 period for UK banks to the actual changes made in the compensation contracts after the introduction of the Remuneration Code. We present these findings in Table IA7 of the Internet Appendix.

In addition, we descriptively explore whether the Remuneration Code affects the sensitivity of equity-based compensation to stock price changes (*Delta*). We hand-collect data from FactSet to compute *Delta* based on Core and Guay [1999], [2002]. In our evaluation of the changes in *Delta*, we find that, on average, UK bank CEOs' compensation has a higher *Delta* relative to other UK CEOs pre-2010 (Table 6, Panel D, column 1). We also observe a higher increase in UK bank CEOs' compensation *Delta* following the introduction of the Remuneration Code relative to the *Delta* observed in compensation contracts of other UK firms' CEOs. In Panel D, column 2, we find that UK bank CEOs' *Delta* is, on average, higher than that of US bank CEOs' before 2010. Following the Remuneration Code introduction, UK bank CEOs' *Delta* increases while we observe a decrease for US banks. Compared with other EU banks (Panel D, column 3), we see a higher *Delta* for UK bank CEOs on average before 2010 but no significant incremental change after 2010 relative to EU banks' CEOs. In further cross-sectional tests for the UK sample (Internet Appendix,

Table IA7), we find that for UK banks in the post-2010 period, the number of contract changes (*Number of Contract Changes (weighted)*) is positively and significantly associated with CEOs' *Delta*. Therefore, we conclude that UK bank CEOs' contracts become more sensitive to performance following the introduction of the Remuneration Code relative to other UK firms.

5.4 Unintended consequences of the Remuneration Code: Effects on unforced turnover

In our final set of analyses, we turn to CEO turnover as one potential unintended consequence of the Remuneration Code. The potential loss of talent due to constrained compensation was one of the main concerns brought up during the consultation stage for the Remuneration Code. For example, during the consultation period of the Walker Review, more than 180 feedback submissions were received. In one of these submissions dated September 30, 2009, Alan Brener, the Director of Regulatory Risk Management at Abbey National plc, stated the following:

> "…Secondly, as you are aware, we are part of a major European banking group which operates globally. Many of our senior management have international careers with Santander Group (Santander) and some, as part of their career, will spend a few years in the UK and are effectively "on loan" to us. Their remuneration is determined by a Remuneration Committee in Madrid and clearly this will comply with both EU and Spanish law and regulations. The pay arrangements will, of course, comply with the UK requirements while they are working in this country.
>
> These individuals are talented and their services are in demand whether it be in the Group's offices in Norway or Chile or Hong Kong or New York. However, if the proposed measures governing remuneration in the UK exceed those of the EU and/or other member states, it is highly likely that a posting to the UK will be unattractive.
>
> Santander is one of the few successful banking groups which has successfully avoided the problems of the current financial crisis. This is due to the mixture of good regulation and good management. There is a danger that inappropriate regulation of remuneration, particularly if it goes further than that required by the EU, may turn the UK into a financial services backwater with, in this case, Santander senior management reluctant to be posted here…"

We collect information regarding what happens to CEOs who leave UK banks in our sample and find that they retire, start their own businesses, or seek and secure jobs in the unregulated part of the financial services sector. In our analysis, we only focus on unforced CEO

turnover for all three subsamples, which we identify by manually checking our sample observations across various sources in the public domain: Factiva and LexisNexis, as well as online searches. We define turnover as unforced if there is a clear indication from multiple sources that the departure was voluntary (e.g., retirement or subsequent appointment at a different firm). We tabulate our results for forced and unforced turnover of banking CEOs in Appendix B. We also list where these CEOs go next, using the information for up to two years after their departure.[34] We find that, unlike CEOs in the US and EU, UK banking CEOs are more likely to leave voluntarily after the introduction of the Remuneration Code. Most importantly, we find that after the introduction of the Remuneration Code, none of the CEOs in our sample who leave voluntarily stay in the banking sector (see the 2010-2012 column in Appendix B, Panel A). The same is not true for bank CEOs in our US or EU samples.

If, as argued in the above example, changes to compensation brought on by the Remuneration Code have constrained firms' ability to achieve the optimal level or structure of pay to retain talent, we would expect to see a higher likelihood of unforced turnover in the post-2010 period. Table 3 shows that average rates of turnover increased for UK banks after the introduction of the UK Remuneration Code (Panel A). During the same period, other UK firms saw lower average turnover rates (Panel B). Average turnover also declined for US banks and increased for EU banks.

We present our multivariate tests in Table 7 using logistic regression. In column (1), we find that the likelihood of unforced turnover for UK bank CEOs increases in the post-2010 period, whereas it decreases for other UK firms during the same time. Columns (2) and (3) present the comparison with US and EU banks, respectively. Column (2) shows that while the likelihood of

[34] We use a similar classification as Engel, Hayes, and Wang [2003].

voluntary turnover decreases in the post-2010 period for US banks, the likelihood of UK bank CEOs' unforced turnover increases post-2010. Column (3), however, shows that the likelihood of unforced turnover by EU bank CEOs is not significantly different from that of UK banks throughout our sample period. Our cross-sectional analysis (presented in the Internet Appendix, Table IA8) shows that the likelihood of unforced CEO turnover increases with the number of contract changes in the post-2010 period for UK banks relative to other UK firms.

While the Remuneration Code has a broader application to employees who earn more than £500,000 per year in total compensation or participate in decision making that influences the risk position, the data limitations and UK disclosure requirements for remuneration reporting only allow us to capture the information for CEOs. Since our sample includes only CEOs, we cannot assess the effect of the Remuneration Code on the unforced turnover of other executives whose compensation was affected by the Remuneration Code and who may have more job mobility than top-level executives.[35]

6 Conclusion

The 2007—2009 financial crisis brought further attention to executive compensation in the financial services industry. In this paper, we examine whether changes in compensation practices of UK banks that explicitly aimed to reduce risk-taking incentives resulted in changes in systemic risk and reduction in firm-specific risk. The UK Remuneration Code sought to change the horizon of incentives by deferring more compensation and tying it directly to future performance. To estimate the effects of regulation, we construct three different sets of comparison groups not

[35] See, for example, the discussion in the popular press: Christopher Langner, "Why Bankers Are Leaving Finance for No-Salary Tech Jobs," *Bloomberg*, available online at http://www.bloomberg.com/news/articles/2015-03-15/bankers-embracing-zero-salary-in-tech-may-make-peers-obsolete.

directly affected by this regulatory change: other large UK firms and US and EU banks of similar size, profitability, and business models. The objective of comparing UK banks with EU and US banks is to have a control group of firms that are similar in size and operations and which experienced the financial crisis but were not exposed to the same regulatory changes.

We begin our analyses by documenting the changes in compensation contracts following the implementation of the Remuneration Code. We then study the impact of the Remuneration Code on systemic risk and find that following the introduction of this regulation, UK banks' contribution and sensitivity to UK systemic risk increases less compared to other large UK firms. However, we find modest evidence of a reduction in risk-taking in the UK subsequent to the introduction of the Remuneration Code. We also document risk-taking incentives in compensation contracts for UK bank CEOs increase after the introduction of the Remuneration Code, which might be due to increased shareholding requirements and usage of options. Our cross-sectional tests for the UK sample allow us to integrate our findings. For UK banks with more material changes in compensation contracts, we find a reduction (relative to other UK firms) in (i) risk-taking incentives, (ii) risk-taking, and (iii) contribution and sensitivity to systemic risk following the introduction of the Remuneration Code. We also find higher unforced turnover among UK banks post-2010, while it decreases for other UK firms and US banks during the same time, potentially due to changes in regulation or changes in job opportunities in the financial services sector. In a cross-section of UK banks and UK firms, this effect is stronger for UK banks that made changes that are more material to CEO compensation contracts.

Following the financial crisis, other regulations aimed at curtailing risk (such as capital and liquidity requirements) were implemented as well. These measures have affected banks not only in the UK but also in the US and the rest of the EU. We mitigate these concerns by stopping our

sample in 2012 before other major regulatory changes become effective for banks. One of the aims of the UK Remuneration Code was to curb banks' risk-taking behavior, which was perceived to be suboptimal from the social point of view. Our findings suggest that the changes required by the Remuneration Code in compensation practices played an incremental role in reducing systemic risk.

Our paper contributes to the literature on executive compensation, and in particular, its regulation. Given the similarities of CEO pay in the UK, EU, and US (e.g., Conyon et al. [2011]), and to the extent that the existing institutions and enforcement are similar across the countries currently in the process of proposing regulation of compensation, our findings from the UK should be of international interest to the parties engaged in the compensation debate. As we have shown in this paper, while the regulatory change might have had some positive consequences, such as its impact on systemic risk, there are also potential costs to regulating executive pay, such as increased unforced turnover. As the European Banking Authority (EBA [2015]) stated, mutual funds under the scope of the Capital Requirements Directive (CRD) are also subject to the same executive compensation bonus cap and deferral requirements starting in 2017. The US financial regulators have also proposed similar changes to compensation contracts for the largest US banks. Therefore, despite focusing on the specific setting of the UK Remuneration Code, our evidence provides some insights regarding the consequences of regulating pay.

Appendix A. Variable definitions

Variable	Definition	Source
% Deferred bonus in total compensation	Share of deferred bonus in total compensation.	Computed by authors using IDS data and Capital IQ
% of Incentives in total compensation	Share of options and LTIPs in total compensation.	Computed by authors using IDS data and Capital IQ
% of Salary in total compensation	Share of base salary in the CEO's total compensation.	Computed by authors using IDS data and Capital IQ
% Options granted in total compensation	Share of the value of options granted during the fiscal year in total compensation.	Computed by authors using IDS data and Capital IQ
% Total bonus in total compensation	Share of total bonus (cash and deferred) in total compensation.	Computed by authors using IDS data and Capital IQ
%LTIP in total plan	Share of long-term incentive performance plans (LTIP) to total compensation.	Computed by authors using IDS data and Capital IQ
Age	Age of the CEO in years.	IDS, CIQ, annual reports
Annual bonus deferral scheme	Indicator variable, which takes the value of 1 if a company has a deferral policy in place for bonuses and 0 otherwise.	IDS, CIQ
Annual bonus scheme	Indicator variable, which takes the value of 1 if a company has an annual bonus scheme in place.	IDS, CIQ
Book to market	Ratio of the book value of assets to the sum of the book value of liabilities plus market value of equity.	Datastream
C&I loans as a proportion of total loans	Ratio of commercial and industrial loans to average total loans for the period.	Bankscope
CDS spread	5-year average annual credit default spread for senior secured debt.	Markit
ΔCoVaR (i,system) 99%	Conditional value at risk measure computed one-period ahead and captures a bank *i*'s sensitivity to systemic risk (i|system) based on Adrian and Brunnermeier [2016].	Computed by authors using Datastream, Bank of England, Eurostat, FactSet, and FRED data
ΔCoVaR (system,i) 99%	Conditional value at risk measure computed one-period ahead and captures a bank *i*'s contribution to overall systemic risk (system|i) based on Adrian and Brunnermeier [2016].	Computed by authors using Datastream, Bank of England, Eurostat, FactSet, and FRED data
Deferral policy compulsory	Indicator variable, which takes the value of 1 if a company has a mandatory bonus deferral policy in place.	IDS
Deferral policy voluntary	Indicator variable, which takes the value of 1 if a company has a voluntary bonus deferral policy in place.	IDS
Deferred bonus	Deferred portion of a bonus received in a given year. Typically subject to performance conditions (£thousands).	IDS, CIQ
Delta	Natural logarithm of the sensitivity of the CEO's equity compensation to stock price. Computed as the dollar change in CEO wealth generated by a 1% increase in the stock price (based on Core and Guay [1999] and [2002]).	Computed by authors using IDS, CIQ, and hand-collected data
Idiosyncratic risk	Standard deviation of the residuals from a market model estimated daily over the previous year (t-1).	Datastream
Leverage	Ratio of the book value of liabilities to the market value of assets.	Datastream

Variable	Definition	Source
Leverage ratio	Computed as Tier 1 regulatory capital divided by tangible assets adjusted by derivative liabilities.	Bankscope
LRMES	Long-run expected marginal shortfall measures expected equity losses for a financial institution conditional on a prolonged market decline.	VLab
NPL as a proportion of total loans	Ratio of non-performing loans (loans overdue by more than 90 days) to average total loans for the period.	Bankscope
Number of contract changes (weighted)	Number of changes to a given compensation component weighted by the importance of this component in total compensation and the number of other aspects of the contract that change at the same time.	Computed by the authors using IDS data
Number of live LTIP schemes	Number of live LTIP schemes.	IDS
Number of live Option schemes	Number of live Option schemes.	IDS
Post-2010	Indicator variable, which takes the value of 1 starting from the fiscal year of 2010 to indicate changes in compensation policy.	
Provisions as a proportion of Total Loans	Provisions for non-performing loans as a proportion of average total loans (banks only).	Bankscope
ROA	Return on assets computed as the ratio of net income before extraordinary items and average total assets.	Datastream
RWA as a proportion of total assets	Ratio of risk-weighted assets to total assets (banks only).	Bankscope
Sales	Sales or gross interest and other income for financial institutions (measured in £thousands), used as a natural logarithm of sales in regression results.	Datastream
Shareholding requirement	Indicator variable, which takes the value of 1 if a company has a shareholding requirement policy in place.	IDS, CIQ
SRISK	Expected capital shortfall of a financial entity conditional on a prolonged market decline, measured as a percent relative to the overall aggregate capital shortfall risk.	VLab
Take-home pay	Take-home pay is defined as total annual cash compensation, which includes salary, cash bonus, and cash "realization" values of formerly deferred pay (measured in £thousands).	IDS, CIQ
Tenure	CEO's tenure measured as the number of years spent with a given firm.	Computed by the authors using IDS and CIQ data
Tier 1 Ratio	Ratio of Tier 1 regulatory capital to risk-weighted assets (banks only).	Bankscope
Total compensation	Total amount received by the CEO in a given year; consists of base salary, total bonus, option, and LTIP incentives grants valued at the point of grants and miscellaneous payments.	Computed by authors using IDS and CIQ data
Total number of bonus targets per year	Total number of performance targets relating to annual bonus payments.	IDS
Total number of LTIP targets per year	Total number of performance targets relating to annual LTIP grants.	IDS

Variable	Definition	Source
Total number of Option targets per year	Total number of performance targets relating to annual Option grants.	IDS
Total number of unique performance targets per year	Number of performance targets for each contract. Overlapping targets, such as TSR for bonus targets and TSR for LTIP performance targets, were counted as one, indicating that an individual needs to meet only one performance target to satisfy performance conditions.	Computed by the authors using IDS
Total volatility	Standard deviation of returns estimated daily over the previous year (t-1).	Datastream
Turnover	Indicator variable, which takes the value of 1 if there is a change of CEO in a given year (we used unforced turnover in our analyses).	Computed by the authors using IDS and CIQ data, and hand-collected data
UK bank	Indicator variable, which takes the value of 1 if the company is a UK-based financial institution subject to the FSA Remuneration Code regulation and 0 otherwise.	FSA
UK bank x Post 2010	Interaction variable between the indicator variable for UK financial institutions and the post-2010 period.	
VaR 99%	Value at Risk measures the worst expected loss over a quarter at the 1% quintile.	Computed by authors using Datastream, Bank of England, Eurostat, FactSet, and FRED data
Vega	Natural logarithm of the sensitivity of the CEO's equity compensation to stock price. Computed as the partial derivative of the value of the CEO's portfolio of options to changes in the annual standard deviation of equity returns multiplied by 0.01 to attain the dollar change in CEO wealth associated with a 1% changed in the standard deviation of the firm's annual returns (based on Core and Guay [1999] and [2002].	Computed by authors using IDS, CIQ, and hand-collected data
Wealth	Defined as the natural logarithm of the CEO's total market value of equity holdings and equity incentives in a given year.	IDS, CIQ
Z-score	Proxy for default risk measuring the proximity of firm default based on the value of its liabilities and the volatility of its returns. Computed as ln((ROA+Leverage)/std(Returns)), where Leverage is defined as a ratio of book equity to total assets (based on Laeven and Levine [2009]).	Computed by the authors using Datastream, CIQ, Bankscope, Compustat Global data

Appendix B. Reasons for turnover

This table presents sources of reasons for banking CEO turnover in our three samples as well as information about where executives move after they have left their current position. *Forced* refers to forced turnover, such as firing, resignations that were prompted by a scandal or poor performance, as well as M&A activities and early retirement. *Unforced* refers to unforced departures and includes CEOs stepping down to assume a different position within a firm. *Reasons for Turnover* refers to reasons for turnover (e.g., retirement or resignation). *Moved to Industry* documents where CEOs found a new job in the same industry (Banking) or elsewhere.

Panel A: Turnover of UK banks' CEOs

Forced /Unforced	Reason for Turnover	Moved to Industry	2006-2009	2010-2012
Forced				
	Legal/Scandal	Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	0	1
	Poor performance	Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	1	0
		No job	1	0
		Other	1	0
	Resigned	Government	0	1
		Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	1	1
		Other	0	1
	Retired	Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	0	1
		No job	0	2
	Takeover	Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	1	0
		Other	1	0
Total Forced			**6**	**7**
Unforced				
	Assumed another position within the firm	Banking	1	0
	Pursue other interests	Banking	1	0
		Government	0	1
		Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	0	1
	Resigned	Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	0	2
		Other	0	1
	Retired	Banking	1	0
		Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	0	1
		Other	0	1
		None	0	2
Total Unforced			**3**	**9**
Total			**9**	**16**

Panel B: Turnover of US banks' CEOs

Forced /Unforced	Reasons for turnover	Moved to Industry	2006-2009	2010-2012
Forced				
	Legal/Scandal	No job	1	0
	Poor performance	Other	1	0
		No job	2	1
	Resigned	No job	0	2
	Closed by regulators	No job	0	1
	Asked by the Board	Consulting	0	1
		No job	1	0
	Management style	Consulting	0	1
Total Forced			**5**	**6**
Unforced				
	Assumed another position within the firm	Banking	0	1
	Death	None	1	0
	Health	None	0	1
	Pursue other interests	None	1	0
	Resigned	Banking	1	2
		Government	0	1
		Other	0	1
		None	1	1
		Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	1	0
	Retired	Banking	0	0
		Consulting	0	1
		Other	2	0
		None	8	5
Total Unforced			**15**	**12**
Total			**20**	**18**

Panel C: Turnover of EU banks' CEOs

Forced /Unforced	Reason for Turnover	Moved to Industry	2006-2009	2010-2012
Forced				
	Changes in government	Banking	0	1
	Fired	Banking	1	1
		Consulting	0	1
		Non-regulated financial sector (e.g., Insurance, Asset Management, Mutual Fund)	1	0
		No job	0	1
	Resigned	Banking	1	0
Total Forced			**3**	**4**
Unforced				
	Assumed another position within the firm	Banking	7	6
	Health	None	2	0
	New position	Banking	0	1
	Resigned	Banking	3	0
		Other	1	1
		None	0	1
	Retired	None	3	6
Total Unforced			**16**	**15**
Total			**19**	**19**

Appendix C. Construction and definitions of systemic risk measures

In this appendix, we describe and define in more detail our main measures of systemic risk. For the first three measures, we follow the methodology of Adrian and Brunnermeier [2016] and Brunnermeier, Dong, and Palia [2020].[36]

The conditional value at risk measure (*ΔCoVaR*) is computed one-period ahead and captures a firm's contribution to overall systemic risk ($\Delta CoVaR_{99\%,t}^{system|i}$) or a firm's sensitivity to systemic risk ($\Delta CoVaR_{99\%,t}^{i|system}$) using quantile regressions. Value at Risk (*VaR*) measures the worst expected loss over a specific time horizon at a given confidence interval and is defined as the quantile:

$$\Pr\left(X^i \leq VaR_q^i\right) = q,$$

where X_i is the return loss of institution *i* for which the VaR_q^i is defined. In this paper, we focus on the 1% quintile and weekly asset returns or losses X^i and the *VaR* of institution *i* is the probability $\Pr\left(X^i \leq VaR_{1\%}^i\right) = 1\%$. Since *VaR* captures losses, it is a negative number by definition, and following the literature, we do not change the signs (in other words, the more negative *VaR* is, the larger the potential loss).

We define $\Delta CoVaR_{99\%,t}^{system|i}$ as the Value at Risk of the entire system (portfolio) conditional upon institution *i*'s level of distress. By reversing the order of conditioning, we also estimate the *VaR* of an individual bank conditional on the *VaR* of the system ($\Delta CoVaR_{99\%,t}^{i|system}$). We use quantile regressions to estimate these time-varying measures based on weekly data as follows:

[36] See also Bushman and Williams [2015] for the application in accounting literature.

$$X_{i,t} = \alpha_i + \beta_i M_{t-1} + \epsilon_{it}$$

$$X_t^{system|i} = \alpha_q^{system|i} + \beta_q^{system|i} M_{t-1} + \gamma_q^{system|i} X_t^i + \epsilon_{q,t}^{system|i},$$

where M_{t-1} is a vector of macro state variables capturing time variation in the conditional moments of asset returns consisting of 1) estimated market volatility for the corresponding UK, US or EU equity market; 2) change in the three-month treasury bill rate for the relevant market to capture the tails of market-valued asset returns; 3) the change in the slope of the yield curve measured as the spread between the composite long-term bond yield in the corresponding market and the three-month Treasury bill rate; 4) a short-term liquidity spread measured as the difference between the three-month LIBOR or EURIBOR rate and the three-month secondary market treasury bill rate in the corresponding market; 5) the change in the credit spread as a difference between Moody's Baa-rated bonds and the 10-year treasury bond in the relevant market; and 6) the weekly market return computed in the relevant market.[37]

Using the predicted values from the regression model above, we can obtain the following unconditional (*VaR*) and conditional (*CoVaR*) measures of risk:

$$VaR_{q,t}^i = \hat{\alpha}_q^i + \widehat{\beta_q^i} M_{t-1}$$

$$CoVaR_{q,t}^i = \hat{\alpha}_q^{system|i} + \hat{\beta}_q^{system|i} M_{t-1} + \hat{\gamma}_q^{system|i} VaR_{q,t}^i$$

This, in turn, allows us to compute $\Delta CoVaR_{q,t}^i$ for each institution *i*:

$$\Delta CoVaR_{q,t}^i = CoVaR_{q,t}^i - CoVaR_{50\%,t}^i = \gamma_q^{system|i}(VaR_{q,t}^i - VaR_{50,t}^i)$$

[37] As explained in Adrian and Brunnermeier [2016], the state variables should not be interpreted as systematic risk factors but rather as variables that condition the mean and volatility of the risk measures.

From these regressions, we obtain weekly *ΔCoVaR*, which we convert to annual figures by averaging the weekly observations within each quarter and year. The approach for computing an individual institution's sensitivity to aggregate systemic risk is calculated similarly.

The other two bank-specific measures of systemic risk that we rely on are from the NYU Stern VLab: *SRISK* and *LRMES*. *SRISK* is defined as the expected capital shortfall of a financial entity conditional on a prolonged market decline. *LRMES* measures the expected equity losses for a financial institution conditional on a prolonged market decline (Brownlees and Engle [2017]). The *SRISK* measure is analogous to the stress tests that regulators apply to financial firms. We use the relative measure of *SRISK* expressed in percentage terms of the overall aggregate risk:

$$SRISK\%_{i,t} = \frac{SRISK_{i,t}}{SRISK_t}, \text{ if } SRISK_{i,t} > 0$$

SRISK, therefore, could be interpreted as a systemic risk share of an individual firm *i* at time *t*. Note, however, that if a firm does not have any capital shortfall (i.e., it has a sufficient amount of capital to withstand a systemic event), its *SRISK* measure is set to be equal to zero. This is a forward-looking, market-based measure of a firm's net worth incorporating the distribution of future assets conditional on a systemic event.

Finally, the *LRMES* measure is computed by VLab following Brownlees and Engle [2017] using a GARCH-DCC model. This measure is an increasing function of market volatility and captures the long-run marginal expected capital shortfall for a financial institution, which is computed using numerical methods.

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Table 1: Sample selection

This table presents our main sample construction. The sample period is 2006-2012.

Panel A: Datasets and sample selection

Source	All Firm-Years	All CEO-Years	Of Which CEO-Years, Non-partial	Of Which CEO-Years, Matched with Control Banks (All Available Data)
CIQ and IDS (All UK FTSE 350 firms)	1,974	1,974	1,539	
Of which UK banks	*125*	*125*	*110*	
CIQ and Bankscope (US banks)	2,346	2,346	2,331	116
CIQ and Bankscope (EU banks)	647	637	594	66

Panel B: Sample sizes across main analyses

Sample	Unique Banks or Firms	Total Observations with CEO and Non-partial Years	Matched Observations (Main Analyses)	Source
UK Banks	26	125	110	CIQ and IDS
UK Other Firms	498	1,539	N/A	CIQ and IDS
US Banks	30	116	116	CIQ and Bankscope
EU Banks	20	66	66	CIQ and Bankscope
Sub-sample of the 10 largest firms by asset size				
UK Banks	10	60	60	CIQ and IDS
UK Other Firms	10	72		CIQ and IDS
US Banks	10	68	68	CIQ and Bankscope
EU Banks	10	46	46	CIQ and Bankscope

Table 2: Compensation contract changes

This table presents the univariate differences of CEO compensation contracts in the UK for UK firms subject to the Remuneration Code (UK banks) and the largest UK companies (constituents of the UK FTSE 350, excluding UK banks). All values are in real, 2012 thousands of pound sterling (£thousands) unless otherwise indicated. UK banks are compared to other UK FTSE 350 constituents before and after the introduction of the Remuneration Code. IDS data coverage of option-based compensation starts in 2007; therefore, our sample in this analysis includes 2008 to 2012 to allow us to compute changes in contractual features. The data contains 75 year-observations corresponding to 26 UK banks (note that not all banks are present in all years due to mergers and failures) and other largest UK FTSE 350 firms (1,008 firm-year observations). To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. All variables are defined in Appendix A. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

	Before FSA Regulation in 2010 (2008-2009)				After FSA Regulation in 2010 (2010-2012)				Difference - in - Differences	
Variables	**Control**	**Treated**	**Difference**	**t-statistic**	**Control**	**Treated**	**Difference**	**t-statistic**		**t-statistic**
	(1)	**(2)**	**(3) = (2) - (1)**	**(4)**	**(5)**	**(6)**	**(7) = (6) - (5)**	**(8)**	**(9) = (7) - (3)**	**(10)**
Total compensation	1,955.18	3,571.68	1,616.49	(10.513)***	2,602.99	4,759.78	2,156.79	(7.727)***	540.30	(4.251)***
Take home pay	1,044.76	1,950.45	905.69	(10.869)***	1,421.19	2,287.07	865.88	(7.042)***	-39.811	(-0.774)
% Salary in total compensation	0.573	0.472	-0.101	(-6.842)***	0.520	0.360	-0.160	(-12.304)***	-0.059	(-3.943)***
% Incentive pay in total compensation	0.042	0.022	-0.020	(-2.15)**	0.036	0.042	0.006	(0.006)	0.027	(2.997)***
% Deferred bonus in total compensation	0.086	0.241	0.155	(15.127)***	0.113	0.306	0.194	(31.177)***	0.039	(7.208)***
Annual bonus scheme	0.984	1.000	0.016	(1.448)	0.987	0.974	-0.013	(-1.787)*	-0.029	(-6.446)***
Annual bonus deferral scheme	0.596	0.929	0.332	(12.961)***	0.732	1.000	0.268	(7.232)***	-0.064	(-2.381)***
Deferral policy compulsory	0.587	0.857	0.270	(9.942)***	0.725	1.000	0.275	(7.478)***	0.005	(0.21)
Deferral policy voluntary	0.086	0.036	-0.050	(-2.78)***	0.097	0.077	-0.020	(-1.003)	0.030	(1.91)*
Number of live LTIP schemes	0.060	0.036	-0.025	(-1.722)*	0.036	0.000	-0.036	(-3.483)***	-0.011	(-0.673)
Number of live Option schemes	0.160	0.143	-0.017	(-0.912)	0.157	0.256	0.100	(6.139)***	0.117	(4.8)***
Shareholding requirement	0.101	0.143	0.042	(4.353)***	0.082	0.192	0.110	(6.114)***	0.068	(4.517)***
Total number of unique performance targets per year	6.422	6.929	0.506	(3.398)***	5.524	5.949	0.425	(2.686)***	-0.081	(-0.516)
Total number of bonus targets per year	3.253	3.964	0.711	(7.223)***	4.002	4.385	0.383	(2.777)***	-0.329	(-2.857)***
Total number of LTIP targets per year	1.197	1.036	-0.162	(-1.991)**	1.431	1.487	0.056	(1.286)	2.520	(2.594)***
Total number of Option targets per year	0.854	0.964	0.110	(1.55)	0.543	0.641	0.098	(2.437)***	-0.012	(-0.201)
Number of contract changes (weighted)	0.974	0.643	-0.331	(-4.178)***	0.537	0.692	0.156	(2.239)**	0.487	(4.043)***

Table 3: Sample descriptive statistics

This table presents the descriptive statistics for the main dependent and control variables used in our analyses for UK banks subject to the Remuneration Code, the largest UK companies (constituents of FTSE 350, excluding UK banks), and matched UK and US banks. All values are in real, 2012 thousands of pound sterling (£thousands) unless otherwise indicated. Panel A presents the summary statistics data for UK banks and Panel B shows the summary statistics for other UK firms. Panel C and Panel D show the descriptive statistics for the matched sample of US and EU banks. We test for differences in means for the three control groups relative to UK banks in the pre and post 2010 periods and present their statistical significance in Panel B (Other UK firms), Panel C (US banks), and Panel D (EU banks). To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. All variables are defined in Appendix A. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: UK Banks

	2006-2009				2010-2012			
Variable	**N**	**Mean**	**Std dev**	**Median**	**N**	**Mean**	**Std dev**	**Median**
Dependent variables: Risk								
$\Delta CoVaR^{(system,i)}_{99\%}$	48	-0.8772	0.5758	-0.7092	33	-0.7639	0.4213	-0.6666
$\Delta CoVaR^{(i,\ system)}_{99\%}$	48	-1.5283	1.2905	-1.1789	33	-1.4908	0.8441	-1.2916
$VaR_{99\%}$	48	-3.8506	1.8977	-3.6236	33	-3.6018	1.1438	-3.4929
LRMES	37	0.4365	0.0938	0.4465	31	0.4738	0.0981	0.4911
SRISK	37	0.0002	0.0004	0.0000	31	0.0002	0.0004	0.0000
Idiosyncratic Risk	65	0.3522	0.2411	0.2775	45	0.2845	0.1212	0.2532
Total Volatility	65	0.4482	0.2697	0.4006	45	0.3583	0.1264	0.3355
Leverage	65	0.6512	0.3231	0.7589	45	0.5703	0.3343	0.5370
Z-Score	64	-0.0260	1.1257	0.0108	45	-0.3255	1.2525	-0.2651
CDS-spread	23	0.0113	0.0130	0.0032	15	0.0211	0.0097	0.0180
Leverage Ratio	33	7.9995	10.3706	3.2110	16	7.3262	9.3879	2.3254
RWA as a Proportion of Total Assets	23	0.6875	0.2603	0.7307	13	0.5212	0.2069	0.4341
Tier 1 Ratio %	23	11.0687	5.4762	9.4000	12	13.5617	2.2063	13.2000
Provisions as a Proportion of Total Loans	33	0.0468	0.0864	0.0118	24	0.0719	0.1116	0.0123
C&I Loans as a Proportion of Total Loans	20	0.4413	0.0920	0.4368	20	0.4472	0.1344	0.5028
NPL as a Proportion of Total Loans %	25	0.0007	0.0018	0.0000	18	0.0013	0.0024	0.0000
Dependent variables: Equity compensation								
Delta	65	3.8322	4.8458	0.0000	45	4.2666	4.2714	4.7038
Vega	65	2.1079	2.9575	0.0000	45	2.9001	3.5916	0.4920
Wealth	65	5.7850	4.0788	6.4533	45	7.8562	3.0537	8.1804
Turnover	68	0.3014	0.4620	0.0000	51	0.3175	0.4692	0.0000
Control variables								
Log(Sales)	65	12.4681	2.0235	12.0570	45	13.3337	2.4016	12.8746
Book to market	65	0.8831	0.8429	0.9240	45	1.0299	1.2323	0.8634
Log(Tenure)	65	1.6236	0.9427	1.7918	45	1.8307	0.9793	1.7918
ROA	65	0.0370	0.0877	0.0079	45	0.0388	0.0811	0.0102
Age	65	50.1385	5.0864	49.0000	44	50.4546	5.5214	50.0000

Panel B: Other UK firms

	2006-2009				2010-2012			
Variable	**N**	**Mean**	**Std dev**	**Median**	**N**	**Mean**	**Std dev**	**Median**
Dependent variables: Risk								
$\Delta CoVaR^{(system,i)}_{99\%}$	627	-0.5454***	0.4059	-0.4541	461	-0.4961***	0.3005	-0.4718
$\Delta CoVaR^{(i,\ system)}_{99\%}$	627	-1.0880**	1.0112	-0.9260	461	-0.8592***	0.5981	-0.7908
$VaR_{99\%}$	627	-3.3724*	1.7421	-2.8966	461	-2.9487***	1.1412	-2.7276
Idiosyncratic Risk	858	0.3339	0.1553	0.2988	572	0.2461**	0.0785	0.2381
Total Volatility	858	0.3924	0.1801	0.3488	572	0.3039***	0.0870	0.2954
Leverage	858	0.4041***	0.2083	0.3851	572	0.4288***	0.2271	0.4071
Z-Score	844	-0.3098**	0.7776	-0.2173	521	-0.1202	0.7227	-0.0404
CDS-spread	496	0.0109	0.0135	0.0032	117	0.0254	0.0083	0.0292
Dependent variables: Equity compensation								
Delta	858	0.1835***	1.3248	0.0000	526	0.2010***	1.4259	0.0000
Vega	858	0.1153***	0.8384	0.0000	526	0.1550***	1.1121	0.0000
Wealth	858	5.6209	3.6799	6.4785	526	7.0303*	3.0208	7.5739
Turnover	1073	0.3281	0.4697	0.0000	851	0.3020	0.4594	0.0000
Control variables								
Log(Sales)	858	11.7715***	1.5032	11.7705	572	13.4326	1.7132	13.3083
Book to market	858	0.6578**	0.2691	0.6307	572	0.7276	0.2706	0.7280
Log(Tenure)	858	1.0865	0.7974	1.7918	526	1.9239	0.8107	1.9459
ROA	857	0.0646***	0.0696	0.0551	569	0.0558	0.0796	0.0520
Age	849	51.3816*	6.6601	51.0000	562	52.0747*	6.1332	51.0000

Panel C: US banks (matched)

	2006-2009				2010-2012			
Variable	**N**	**Mean**	**Std dev**	**Median**	**N**	**Mean**	**Std dev**	**Median**
Dependent variables: Risk								
$\Delta CoVaR^{(system,i)}_{99\%}$	42	-1.6884***	1.4314	-1.6478	49	-1.374***	0.7412	-1.4931
$\Delta CoVaR^{(i,system)}_{99\%}$	42	-0.7033***	0.9985	-0.5788	49	-0.3424***	0.4959	-0.3514
$VaR_{99\%}$	42	-4.9764	4.2257	-3.8451	49	-3.3016	2.3704	-2.6939
LRMES	28	0.4192	0.0983	0.4157	27	0.4196***	0.0630	0.4231
SRISK	28	0.0001	0.0002	0.0000	27	0.0002	0.0003	0.0000
Idiosyncratic Risk	56	0.5224***	0.3540	0.4384	61	0.4006***	0.2945	0.3042
Total Volatility	56	0.5455	0.3763	0.4557	61	0.4355*	0.2873	0.3459
Leverage	56	0.8197***	0.2462	0.8921	61	0.8398***	0.2239	0.8974
Z-Score	56	0.5330***	0.9689	0.5869	61	0.7113***	0.6668	0.9354
CDS-spread	34	0.0105	0.0141	0.0032	14	0.0151*	0.0080	0.0128
Leverage Ratio	56	2.9238***	0.0862	0.8283	61	4.781	2.0800	0.8743
RWA as a Proportion of Total Assets	17	0.7326	0.1814	0.7316	39	0.6490**	0.1852	0.7059
Tier 1 Ratio %	43	12.6293	7.8888	10.8700	48	14.6023	6.6133	12.8950
Provisions as a Proportion of Total Loans	54	0.0202*	0.0405	0.0070	56	0.0101***	0.0122	0.0055
C&I Loans as a Proportion of Total Loans	47	0.3138***	0.2225	0.2642	51	0.2256***	0.1725	0.1937
NPL as a Proportion of Total Loans %	53	0.0003	0.0011	0.0000	57	0.0005	0.0017	0.0000
Dependent variables: Equity compensation								
Delta	56	5.5299**	3.3971	6.7174	61	4.1802	3.0999	3.8448
Vega	56	5.5941***	3.0909	6.2759	61	4.9230***	3.2555	5.2847
Wealth	56	7.5262***	3.1151	8.5455	61	7.6683	2.7652	7.9785
Turnover	71	0.2113	0.2477	0.0000	73	0.1644**	0.1781	0.0000
Control variables								
Log(Sales)	56	11.7587*	2.6048	12.1389	61	13.2354	2.6965	13.2418
Book to market	56	0.9700	0.1212	0.9999	61	0.9765	0.1001	0.9847
Log(Tenure)	40	1.3711	1.1583	1.3863	50	1.4786	1.1636	1.5078
ROA	56	0.0092***	0.0345	0.0067	59	0.0105**	0.0205	0.0079
Age	55	55.1818***	5.5213	56.0000	61	57.623***	6.3749	56.0000

Panel D: EU banks (matched)

	2006-2009				2010-2012			
Variable	**N**	**Mean**	**Std dev**	**Median**	**N**	**Mean**	**Std dev**	**Median**
Dependent variables: Risk								
$\Delta CoVaR^{(system,i)}_{99\%}$	28	-1.6201***	1.1227	-1.4004	19	-1.9359*	2.6063	-2.3609
$\Delta CoVaR^{(i,system)}_{99\%}$	28	-0.1350***	0.2799	-0.0869	19	-0.0351***	0.3616	-0.0036
$VaR_{99\%}$	28	-2.9861**	1.4420	-2.4280	19	-4.3995	2.9344	-3.5493
LRMES	22	0.4067	0.1171	0.4048	15	0.5513***	0.0936	0.5602
SRISK	22	0.0011***	0.0014	0.0005	15	0.0011***	0.0009	0.0011
Idiosyncratic Risk	40	0.2680**	0.1335	0.2021	27	0.3169	0.1699	0.3015
Total Volatility	40	0.3433***	0.1739	0.2677	27	0.4249*	0.1838	0.3773
Leverage	40	0.7602*	0.3319	0.9263	27	0.8454***	0.2800	0.9700
Z-Score	39	0.7902***	0.8183	1.0790	27	0.6780***	0.5140	0.7649
CDS-spread	27	0.0178	0.0397	0.0032	15	0.0201	0.0101	0.0156
Leverage Ratio	40	1.8311*** *	0.0203	1.2569	27	14.1725***	0.5160	12.3414
RWA as a Proportion of Total Assets	27	0.4812***	0.2242	0.5088	22	0.3403***	0.1851	0.3063
Tier 1 Ratio %	30	9.0347	3.0033	8.2000	20	13.0720	2.9244	12.1000
Provisions as a Proportion of Total Loans	30	0.005***	0.0046	0.0039	22	0.0092***	0.0064	0.0076
C&I Loans as a Proportion of Total Loans	8	0.474	0.2512	0.4494	8	0.2661*	0.2388	0.1794
NPL as a Proportion of Total Loans %	25	0.000**	0.0000	0.0000	19	0.0000**	0.0000	0.0000
Dependent variables: Equity compensation								
Delta	40	0.0000***	0.0000	0.0000	27	0.2327***	1.2093	0.0000
Vega	40	0.0000***	0.0000	0.0000	27	0.2670***	1.3874	0.0000
Wealth	40	1.9469***	3.6218	0.0000	27	2.7039***	3.7780	0.0000
Turnover	56	0.2857	0.2207	0.0000	42	0.3571	0.3620	0.0000
Control variables								
Log(Sales)	40	12.8048	2.0968	13.4226	27	14.8614***	2.4655	15.9048
Book to market	40	1.0042	0.1549	1.0018	26	0.9629	0.1362	0.9868
Log(Tenure)	40	1.6726	0.7792	1.6094	27	1.5405	0.9904	1.3863
ROA	39	0.0081**	0.0422	0.0046	26	0.0187	0.0575	0.0035
Age	35	56.5143***	9.5590	57.0000	24	58.9167***	10.7619	59.5000

Table 4: Effect of the new regulation on systemic risk

This table presents the results of OLS regressions to estimate the effect of new regulation on systemic risk. *ΔCoVaR* corresponds to contributions to systemic risk (*system*|*i*) or sensitivity to systemic risk (*i*|*system*). *VaR* is the measure of value at risk. *LRMES* measures the expected equity losses for a financial institution conditional on a prolonged market decline. *SRISK %* measures capital shortfall relative to the overall system. *UK bank* is equal to one for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. All other variables are defined in Appendix A. The sample period is 2006-2012. Tests in Panel A are for the 10 largest UK banks and the 10 largest UK firms by asset size. Panels A, B, and C include 62 bank-year- observations for the 10 largest UK banks. Panel B includes matched US banks, which represent 66 bank-year observations for the largest 10 US banks. Panel C includes matched EU banks, which represent 47 matched bank-year observations for the 10 largest EU banks. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level (Panel A) and robust standard errors (Panels B and C). ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: UK Banks vs. Other UK Firms (Largest UK Banks vs. Largest Other UK Firms)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$
	(1)	(2)	(3)
UK bank	-0.46***	-0.40***	-0.35***
	(-8.684)	(-10.749)	(-27.531)
Post 2010	-0.98***	-0.91***	-0.84***
	(-7.552)	(-15.113)	(-53.301)
UK bank x Post 2010	0.80***	0.77***	0.98***
	(6.987)	(10.335)	(55.699)
$Log(Sales)_{t-1}$	0.27***	0.37***	0.12***
	(18.273)	(26.996)	(5.689)
Book to market $_{t-1}$	-0.02	-1.23**	0.96***
	(-0.215)	(-3.541)	(5.071)
Leverage $_{t-1}$	-0.46***	0.71***	-0.86***
	(-41.641)	(4.152)	(-14.656)
Industry Indicators	Yes	Yes	Yes
Observations	132	132	132
Adjusted R-squared	0.449	0.267	0.115

Panel B: Banks-specific comparisons of systemic risk (Largest UK Banks vs. Largest US Banks)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$	**LRMES**	**SRISK % (relative to system)**
	(1)	(2)	(3)	(4)	(5)
UK bank	-2.01***	1.98***	-2.53***	0.02	0.00*
	(-5.988)	(4.804)	(-2.911)	(0.624)	(1.942)
Post 2010	-0.91**	-0.56***	-1.51	-0.02	-0.00
	(-2.243)	(-2.622)	(-1.382)	(-0.733)	(-1.365)
UK bank x Post 2010	0.77*	0.66	1.66	0.02	0.00
	(1.935)	(1.378)	(1.434)	(0.688)	(0.202)
$Log(Sales)_{t-1}$	0.22***	0.09	0.38**	0.02***	0.00***
	(3.026)	(1.034)	(2.156)	(4.124)	(6.640)
Book to market $_{t-1}$	0.02	1.20	-4.55	0.09	-0.00
	(0.016)	(0.893)	(-1.325)	(0.987)	(-1.086)
Leverage $_{t-1}$	-0.64	0.00	3.55	-0.23***	0.00*
	(-0.705)	(0.002)	(1.339)	(-3.215)	(1.884)
Intercept	0.92	-1.69	2.47	0.20***	-0.00***
	(1.045)	(-1.286)	(1.350)	(2.780)	(-6.107)
Observations	128	128	139	106	106
Adjusted R-squared	0.366	0.355	0.629	0.221	0.413

Panel C: Banks-specific comparisons of systemic risk (Largest UK Banks vs. Largest EU Banks)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$	**LRMES**	**SRISK % (relative to system)**
	(1)	(2)	(3)	(4)	(5)
UK bank	-2.61*	2.99***	0.48	-0.00	-0.00***
	(-1.959)	(6.391)	(1.070)	(-0.168)	(-3.799)
Post 2010	0.31	1.97	1.38*	0.06**	-0.00*
	(0.190)	(1.541)	(1.975)	(2.140)	(-1.779)
UK bank x Post 2010	0.18	-1.86	-1.12	-0.06*	0.00
	(0.102)	(-1.397)	(-1.355)	(-1.761)	(1.309)
$Log(Sales)_{t-1}$	-0.34	0.12	0.10	0.04***	0.00***
	(-0.674)	(0.706)	(0.855)	(6.008)	(6.265)
Book to market $_{t-1}$	-0.34	0.54	-1.23**	-0.09**	-0.00***
	(-0.239)	(0.739)	(-1.990)	(-2.113)	(-3.225)
Leverage $_{t-1}$	1.42	0.61	1.10**	-0.13***	0.00*
	(0.666)	(0.987)	(2.204)	(-3.707)	(1.745)
Intercept	7.58	-2.90	2.04	0.13*	-0.00***
	(1.136)	(-1.563)	(1.408)	(1.830)	(-3.165)
Observations	106	106	106	94	94
Adjusted R-squared	0.047	0.167	0.062	0.401	0.466

Table 5: Effect of the new regulation on risk-taking

This table presents the results of OLS regressions to estimate the effect of new regulation on risk. Panel A presents results using the idiosyncratic measure of volatility (*Idiosyncratic risk*) computed from the market model, *Total Volatility*, *Leverage*, *Z-score* (as a measure of default risk), and *CDS spread* (5-year average annual credit default spread) for the UK sample. Panel B and Panel C present bank-specific measures of risk and compare UK banks to US and EU banks, respectively. *Leverage ratio (for banks only)* is Tier 1 regulatory capital divided by tangible assets adjusted by derivative liabilities. *Tier 1 Ratio* is the ratio of Tier 1 regulatory capital to risk-weighted assets. *Provisions as a Proportion of Total Loans* is a ratio of annual provisions to average total loans for the period. *C&I Loans as a Proportion of Total Loans* is a ratio of commercial and industrial loans to average total loans for the period. *NPL as a Proportion of Total Loans* is a ratio of non-performing loans (loans overdue by more than 90 days) to average total loans for the period. *UK bank* is equal to one for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. All other variables are defined in Appendix A. The sample period is 2006-2012. Panels A, B, and C use 110 year-observations corresponding to 26 UK banks (note that not all firms are present in all years due to mergers and failures). Tests in Panel A are for the UK market and include the largest UK FTSE 350 firms (1,428 firm-year observations). For CDS spread data, we have 28 UK bank-year observations for the 10 UK banks with available data. Panel B has matched US banks, which represent 116 bank-year observations. Panel C includes matched EU banks, which represent 66 bank-year observations. CDS and bank risk measures have smaller sample sizes due to data limitations. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level (Panel A) and robust standard errors (Panels B and C). ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: UK Banks vs. Other UK Firms (General risk)

	Idiosyncratic Risk	**Total Volatility**	**Leverage**	**Z-score**	**CDS-spread**
	(1)	(2)	(3)	(4)	(5)
UK bank	-0.00	-0.01**	0.12***	0.33***	0.00
	(-0.119)	(-2.477)	(22.257)	(13.205)	(0.345)
Post 2010	-0.07***	-0.09***	-0.05***	0.04	0.01***
	(-5.025)	(-4.916)	(-4.914)	(0.800)	(4.300)
UK bank x Post 2010	0.01	-0.00	-0.02**	-0.41***	-0.01**
	(1.284)	(-0.002)	(-2.945)	(-5.943)	(-2.537)
$Log(Sales)_{t-1}$	-0.01**	-0.00	0.01	0.07***	0.00***
	(-2.958)	(-0.120)	(0.768)	(3.259)	(3.902)
Book to market $_{t-1}$	0.03**	0.04**	0.08***	-0.06	0.01
	(2.210)	(2.183)	(3.284)	(-0.274)	(1.732)
Leverage $_{t-1}$	0.08	0.05	0.48***	0.71***	-0.01**
	(1.682)	(0.889)	(8.063)	(4.032)	(-2.907)
Industry Indicators	Yes	Yes	Yes	Yes	Yes
Observations	1,538	1,537	1,537	1,429	499
Adjusted R-squared	0.153	0.149	0.521	0.268	0.110

Panel B: Banks-specific measures of risk (UK Banks vs. US Banks)

	Leverage Ratio	**RWA as a Proportion of Total Assets**	**Tier1 Ratio**	**Provisions as a Proportion of Total Loans**	**C&I Loans as a Proportion of Total Loans**	**NPL as a Proportion of Total Loans**	**Z-score**	**CDS-Spread**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UK bank	7.37***	0.05	-0.04	0.03	0.10**	0.00***	-0.09	0.00
	(3.936)	(0.628)	(-1.495)	(1.054)	(2.304)	(3.296)	(-0.582)	(0.108)
Post 2010	0.59	-0.03	-0.01	0.06	-0.09**	0.00*	0.25**	0.01
	(1.513)	(-0.531)	(-0.488)	(0.876)	(-2.452)	(1.870)	(2.256)	(1.006)
UK bank x Post 2010	-1.72	-0.06	0.07**	-0.05	0.09	-0.00	-0.46*	-0.00
	(-0.603)	(-0.633)	(2.256)	(-0.565)	(1.335)	(-0.193)	(-1.791)	(-0.191)
$Log(Sales)_{t-1}$	0.22	-0.03***	0.00	-0.00	0.01	-0.00***	-0.02	0.00
	(1.581)	(-3.214)	(0.286)	(-0.716)	(1.077)	(-3.961)	(-0.755)	(1.036)
Book to market $_{t-1}$	0.55**	-0.26*	-0.09	0.07	0.07	0.00	0.15*	0.01
	(2.111)	(-1.952)	(-0.285)	(0.312)	(0.251)	(1.337)	(1.941)	(0.979)
Leverage $_{t-1}$	5.04***	0.12	-0.56**	-0.26	0.02	-0.00**	1.25***	-0.01
	(3.624)	(0.835)	(-2.148)	(-1.451)	(0.123)	(-2.500)	(6.791)	(-1.221)
Intercept	-7.30***	1.19***	0.71***	0.22**	0.15	0.00***	-0.69**	0.00
	(-3.817)	(6.694)	(4.196)	(2.383)	(0.756)	(4.203)	(-2.411)	(0.087)
Observations	173	98	132	146	114	156	267	97
Adjusted R-squared	0.270	0.059	0.436	0.012	0.064	0.263	0.196	0.021

Panel C: Banks-specific measures of risk (UK Banks vs. EU Banks)

	Leverage Ratio	**RWA as a Proportion of Total Assets**	**Tier1 Ratio**	**Provisions as a Proportion of Total Loans**	**C&I Loans as a Proportion of Total Loans**	**NPL as a Proportion of Total Loans**	**Z-score**	**CDS-Spread**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UK bank	7.60***	0.26***	-0.01	-0.01	0.04	-0.00	-0.33**	-0.00
	(4.101)	(3.535)	(-1.388)	(-0.749)	(0.602)	(-0.430)	(-2.238)	(-0.715)
Post 2010	0.06	-0.02	0.02**	-0.01	-0.13	-0.00	-0.07	-0.01
	(0.113)	(-0.286)	(2.143)	(-1.152)	(-1.622)	(-0.213)	(-0.511)	(-0.698)
UK bank x Post 2010	-1.16	-0.05	0.01	0.03	0.20*	0.00	-0.13	0.01
	(-0.389)	(-0.460)	(0.528)	(1.426)	(1.822)	(0.008)	(-0.480)	(0.849)
$Log(Sales)_{t-1}$	0.04	-0.04**	0.01*	0.01***	-0.02	-0.00	0.01	0.00
	(0.147)	(-1.994)	(1.784)	(3.381)	(-0.890)	(-0.357)	(0.177)	(1.624)
Book to market $_{t-1}$	0.49*	-0.43**	0.33**	-0.14***	-0.21	-0.00	0.16**	0.00
	(1.978)	(-2.411)	(2.300)	(-8.445)	(-0.205)	(-0.036)	(1.977)	(0.104)
Leverage $_{t-1}$	3.47**	-0.06	-0.67***	-0.28***	-0.85	-0.00***	1.45***	-0.00
	(2.415)	(-0.185)	(-5.058)	(-7.518)	(-0.669)	(-6.628)	(6.830)	(-0.618)
Intercept	-3.58	1.43***	0.32***	0.29***	1.76***	0.00***	-0.87**	-0.03
	(-1.423)	(4.357)	(7.245)	(6.476)	(2.714)	(5.608)	(-2.261)	(-1.060)
Observations	127	88	90	115	115	90	223	63
Adjusted R-squared	0.256	0.320	0.742	0.612	0.177	0.733	0.267	0.026

Table 6: Effect of the new regulation on the sensitivity of equity-based compensation to changes in stock price and volatility

This table presents the results of OLS regressions to estimate CEOs' equity-based compensation sensitivity to performance. Panel A presents the results for UK banks and the largest other UK non-financial firms. Panel B and Panel C present the same estimation using the propensity-score matched samples of US and EU banks, respectively. Panel D presents results for CEO's equity-based compensation (*Delta*) to changes in stock price for all three samples. *Vega* is the natural logarithm of the partial derivative of the value of the CEO's portfolio of options to changes in the annual standard deviation of equity returns multiplied by 0.01 to attain the dollar change in CEO wealth associated with a 1% change in the standard deviation of the firm's annual returns. *Wealth* is the natural logarithm of the CEO's total market value of equity holdings and equity incentives in a given year. *Delta* is the natural logarithm of the dollar change in CEO wealth generated by a 1% increase in the stock price. *UK bank* is equal to 1 for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. All other variables are defined in Appendix A. Panels A, B, and C use 110 year-observations corresponding to 26 UK banks (note that not all firms are present in all years due to mergers and failures). Tests in Panel A are for the UK market and include other largest UK FTSE 350 firms (1,384 firm-year observations). Panel B includes matched US banks, which represent 116 bank-year observations. Panel C includes matched EU banks, which represent 66 bank-year observations. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of t-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level (Panel A and column (1) of Panel D) and robust standard errors (Panels B, C and columns (2) and (3) of Panel D). ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: UK Banks vs. Other UK Firms

	Vega	**Wealth**
	(1)	(2)
UK bank	0.90***	-0.77***
	(13.524)	(-7.952)
Post 2010	0.11	0.48*
	(1.439)	(2.097)
UK bank x Post 2010	0.91***	0.67***
	(25.200)	(3.135)
$Log(Sales)_{t-1}$	-0.08	0.53***
	(-1.300)	(5.766)
$Book\ to\ market_{t-1}$	-0.33***	-0.08
	(-8.892)	(-0.441)
$Log(Idio.\ Risk)_{t-1}$		0.14
		(0.678)
$Log(Tenure)_{t-1}$	0.08	1.04***
	(1.300)	(4.982)
$Leverage_{t-1}$	1.57*	-3.30***
	(1.967)	(-6.651)
Industry Indicators	Yes	Yes
Observations	1,494	1,494
Adjusted R-squared	0.275	0.168

Panel B: UK Banks vs. US Banks

	Vega	**Wealth**
	(1)	(2)
UK bank	-1.01**	-1.20*
	(-2.110)	(-1.838)
Post 2010	-0.44	0.03
	(-0.913)	(0.069)
UK bank x Post 2010	1.73**	1.49*
	(2.258)	(1.888)
$Log(Sales)_{t-1}$	-0.13	0.23**
	(-1.602)	(2.347)
$Book\ to\ market_{t-1}$	-0.44***	-0.14
	(-2.879)	(-0.534)
$Log(Idio.\ Risk)_{t-1}$		0.48*
		(1.771)
$Log(Tenure)_{t-1}$	0.33*	1.15***
	(1.662)	(5.372)
$Leverage_{t-1}$	5.84***	-0.69
	(9.997)	(-0.797)
Intercept	0.77	3.34***
	(0.783)	(2.656)
Observations	307	307
Adjusted R-squared	0.194	0.111

Panel C: UK Banks vs. EU Banks

	Vega	**Wealth**
	(1)	(2)
UK bank	1.94***	0.67
	(5.272)	(0.877)
Post 2010	0.88**	1.10
	(1.973)	(1.468)
UK bank x Post 2010	0.04	0.44
	(0.049)	(0.459)
$Log(Sales)_{t-1}$	-0.09	0.05
	(-1.013)	(0.328)
$Book\ to\ market_{t-1}$	-0.36***	0.25
	(-3.818)	(0.755)
$Log(Idio.\ Risk)_{t-1}$		-1.62***
		(-4.575)
$Log(Tenure)_{t-1}$	0.48**	0.76***
	(2.348)	(2.629)
$Leverage_{t-1}$	2.38***	-1.19
	(4.159)	(-1.193)
Intercept	-0.69	2.09
	(-0.674)	(1.290)
Observations	246	246
Adjusted R-squared	0.185	0.195

Panel D: Deltas for UK Banks vs. Other UK Firms, US Banks and EU Banks

	UK Banks vs. UK Firms	**UK Banks vs. US Banks**	**UK Banks vs. EU Banks**
	(1)	(2)	(3)
UK bank	2.07***	1.26*	2.55***
	(20.509)	(1.872)	(4.101)
Post 2010 indicator	0.05	-1.31***	0.83
	(1.498)	(-2.818)	(1.592)
UK bank x Post 2010	0.71***	2.07**	-0.13
	(5.663)	(2.270)	(-0.137)
$Log(Sales)_{t-1}$	-0.14	0.10	-0.23*
	(-1.428)	(0.982)	(-1.811)
$Book\ to\ market_{t-1}$	-0.45***	-1.00***	-0.22
	(-12.551)	(-4.435)	(-1.198)
$Log(Idio.\ Risk)_{t-1}$	-0.39*	1.25***	-1.24***
	(-1.880)	(4.449)	(-3.931)
$Log(Tenure)_{t-1}$	0.10	0.67***	0.50**
	(1.346)	(2.967)	(2.030)
$Leverage_{t-1}$	2.47*	5.72***	4.39***
	(2.102)	(7.799)	(5.599)
Intercept		-1.23	-0.74
		(-1.037)	(-0.533)
Industry Indicators	Yes	No	No
Observations	1,494	307	246
Adjusted R-squared	0.328	0.194	0.290

Table 7: Effect of the new regulation on CEO turnover

This table presents conditional logistic (column 1) and logistic regressions (columns 2 and 3) to estimate the effect of new regulation on the likelihood of CEO turnover. *UK bank* is equal to 1 for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. All variables are defined in Appendix A. The sample period is 2007-2012. The sample includes information for CEOs with partial years and does not impose restrictions on all variables being available as in other tables. Columns (1)-(3) uses 122 year-observations corresponding to 26 UK banks (note that not all firms are present in all years due to mergers and failures). Column (1) shows results for the UK market and includes the largest UK FTSE 350 firms (1,412 firm-year observations). Column (2) includes matched US banks, which represent 212 bank-year observations. Column (3) includes matched EU banks, which represent 137 bank-year observations. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. The values of *z*-statistics (reported in parentheses) are computed based on robust standard errors. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

	UK Banks vs. UK Firms	**UK Banks vs. US Banks**	**UK Banks vs. EU Banks**
	(1)	(2)	(3)
UK bank	-0.19***	0.20	0.38
	(-2.747)	(0.467)	(0.811)
Post 2010	-0.20*	-0.78*	0.17
	(-1.790)	(-1.891)	(0.342)
UK bank x Post 2010	0.62***	1.19*	0.23
	(5.248)	(1.882)	(0.340)
Shareholder return $_{t-1}$	0.22**	0.10	0.05
	(2.342)	(0.393)	(0.164)
ROA $_{t-1}$	-0.83	-2.08	-0.02
	(-1.518)	(-1.046)	(-0.010)
Book to market $_{t-1}$	0.28***	0.19	0.15
	(4.919)	(1.045)	(0.884)
Log(Tenure) $_{t-1}$	-0.47***	0.01	-0.01
	(-4.580)	(0.051)	(-0.044)
Age $_{t}$	0.05***	0.02	0.01
	(3.695)	(0.729)	(0.579)
Intercept		-2.38*	-3.25***
		(-1.844)	(-2.941)
Industry Indicators	Yes	No	No
Observations	1,553	284	201
Pseudo R-squared	0.0404	0.0411	0.0402

Internet Appendix for

Regulation of Compensation and Systemic Risk: Evidence from the UK

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Table IA1: Compensation sample descriptive statistics

This table presents the descriptive statistics for the compensation variables used in our supplemental analyses in the Internet Appendix for UK banks subject to the Remuneration Code, the largest UK companies (constituents of FTSE 350, excluding UK banks), and matched UK and US banks. All values are in real, 2012 thousands of pound sterling (£thousands) unless otherwise indicated. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. All variables are defined in Appendix A of the manuscript.

	2006-2009				2010-2012			
UK Banks	**N**	**Mean**	**Std dev**	**Median**	**N**	**Mean**	**Std dev**	**Median**
Descriptive variables: Compensation								
Total compensation	65	3,462.58	2,796.31	2,884.00	45	4,699.21	5,538.61	3,467.00
Take home pay	65	1,961.94	1,550.53	1,504.02	45	2,267.05	1,704.81	1,646.00
% Salary in total comp.	65	0.4163	0.3272	0.3443	45	0.3556	0.2997	0.2671
% Total bonus in total comp.	65	0.3627	0.2939	0.3473	45	0.3772	0.2931	0.2983
% Incentives pay in total comp.	65	0.0412	0.1333	0.0003	45	0.0411	0.1454	0.0004
% Deferred bonus in total comp.	65	0.1759	0.2473	0.0000	45	0.3075	0.2194	0.2870
UK Other Firms								
Descriptive variables: Compensation								
Total compensation	858	1,766.63	1,956.96	1,180.03	572	2,604.49	2,554.43	1,747.35
Take home pay	858	1,014.55	736.76	781.78	572	1,423.93	931.91	1,155.40
% Salary in total comp.	858	0.5585799	0.2108	0.5329	572	0.5189	0.2090	0.4891
% Total bonus in total comp.	858	0.2319029	0.1678	0.2242	573	0.2526	0.1723	0.2445
% Incentives pay in total comp.	858	0.0418	0.1307	0.0002	572	0.0355	0.1245	0.0004
% Deferred bonus in total comp.	858	0.0784164	0.1333	0.0000	572	0.1354	0.3849	0.0296
US Banks								
Descriptive variables: Compensation								
Total compensation	56	5,857.90	6,708.63	2,623.84	61	4,883.86	5,936.47	1,761.14
Take home pay	56	1,018.32	1,125.04	584.26	61	1,423.02	1,470.65	695.95
% Salary in total comp.	56	0.2907	0.3108	0.1350	61	0.3473	0.3005	0.2740
% Total bonus in total comp.	56	0.1924	0.2346	0.0786	61	0.1627	0.2042	0.1131
% Incentives pay in total comp.	47	0.3381	0.3567	0.2267	60	0.1722	0.2472	0.0206
EU Banks								
Descriptive variables: Compensation								
Total compensation	39	1,704.79	2,065.48	1,090.74	27	1,942.42	2,054.87	1,309.08
Take home pay	37	1,481.75	1,627.59	891.70	25	1,541.63	1,420.47	1,449.76
% Salary in total comp.	39	0.5802	0.2719	0.6101	26	0.6129	0.2881	0.5470
% Total bonus in total comp.	40	0.3360	0.2528	0.3152	27	0.2406	0.2093	0.2334
% Incentives pay in total comp.	4	0.0027	0.0054	0.0000	11	0.0596	0.0731	0.0000

Table IA2: Determinants of CEO compensation

This table presents the results of OLS regression estimation of the determinants of CEO compensation for CEOs of the largest UK banks and other UK firms in Panel A. Panel B and Panel C present the same estimation using the propensity-score matched samples of US and EU banks, respectively. *Log CEO Total Compensation* is the natural logarithm of CEOs' total compensation computed as the sum of basic salary, total bonus, other benefits, options granted valued using the Black Scholes method, and LTIPs valued as options, restricted stock or cash depending on their respective category. *Log CEO Salary* is the natural logarithm of CEOs' base salary. *Log CEO Incentive Grants* is the natural logarithm of CEOs' incentive pay computed as the sum of values of deferred bonus, options granted, and LTIPs granted. *Log CEO Deferred Bonus* is the natural logarithm of CEOs' total deferred bonus in a given year. *UK bank* is equal to 1 for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. All other variables are defined in Appendix A. The sample period is 2006-2012. Panels A, B, and C use 110 year-observations corresponding to 26 UK banks (note that not all firms are present in all years due to mergers and failures). Tests in Panel A are for the UK market and include the largest UK FTSE 350 firms (1,429 firm-year observations). Panel B has matched US banks, which represent 116 bank-year observations. Panel C includes matched EU banks, which represent 66 bank-year observations. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level (Panel A) and robust standard errors (Panels B and C). ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: UK Banks vs. Other UK Firms

	Log CEO Total Compensation		**Log CEO Salary**		**Log CEO Incentive Grants**		**Log CEO Deferred Bonus**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UK bank	0.52***	0.49***	-0.15***	-0.16***	0.40***	0.42***	0.91***	0.23***
	(20.811)	(11.226)	(-18.849)	(-15.517)	(7.014)	(6.656)	(11.236)	(3.477)
Post 2010		-0.12		-0.14***		-0.32**		0.37
		(-1.436)		(-5.008)		(-2.230)		(1.588)
UK bank x Post 2010		0.09		0.03		-0.04		1.64***
		(1.048)		(1.574)		(-0.298)		(10.867)
$Log(Sales)_{t-1}$	0.26***	0.28***	0.19***	0.21***	0.17**	0.21**	0.40***	0.34***
	(13.129)	(11.467)	(11.169)	(11.097)	(2.546)	(2.833)	(6.702)	(3.971)
$Book\ to\ market_{t-1}$	-0.04	-0.03	0.08**	0.10***	0.48	0.54	0.65**	0.52**
	(-0.206)	(-0.125)	(2.426)	(3.747)	(1.381)	(1.697)	(2.786)	(2.368)
$Log(Idio.\ Risk)_{t-1}$	-0.30**	-0.32**	-0.09	-0.11*	-0.05	-0.11	-1.11***	-1.03***
	(-2.640)	(-2.890)	(-1.548)	(-2.057)	(-0.414)	(-0.903)	(-4.426)	(-3.541)
$Log(Tenure)_{t-1}$	0.11	0.12	0.01	0.01	0.05	0.07	0.10	0.07
	(1.638)	(1.756)	(0.198)	(0.543)	(0.629)	(0.864)	(0.893)	(0.606)
$Leverage_{t-1}$	0.20	0.15	-0.14***	-0.21***	-0.50	-0.67**	-0.19	0.14
	(1.709)	(1.241)	(-3.078)	(-4.419)	(-1.676)	(-2.172)	(-0.590)	(0.351)
$Shareholder\ return_t$	0.01	0.01	-0.01	-0.01	-0.03	-0.03	0.07	0.06
	(0.183)	(0.171)	(-0.547)	(-0.667)	(-0.386)	(-0.411)	(0.557)	(0.510)
Industry Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,539	1,539	1,539	1,539	1,539	1,539	1,539	1,539
Adjusted R-squared	0.167	0.167	0.118	0.118	0.055	0.059	0.180	0.192

Panel B: UK Banks vs. US Banks

	Log CEO Total Compensation		**Log CEO Salary**		**Log CEO Incentive Grants**		**Log CEO Deferred Bonus**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UK bank	0.18	0.10	-0.09	-0.10	-0.43	-0.35	0.83**	-0.09
	(1.046)	(0.481)	(-1.555)	(-1.156)	(-1.603)	(-0.866)	(1.997)	(-0.167)
Post 2010		-0.32		-0.08		-0.01		0.02
		(-1.535)		(-0.664)		(-0.020)		(0.053)
UK bank x Post 2010		0.16		0.01		-0.19		2.16***
		(0.442)		(0.073)		(-0.311)		(2.882)
$Log(Sales)_{t-1}$	0.28***	0.30***	0.19***	0.20***	0.10	0.11	0.19**	0.12
	(6.805)	(7.064)	(7.508)	(7.975)	(1.141)	(1.143)	(2.032)	(1.274)
$Book\ to\ market_{t-1}$	0.08	0.08	0.08**	0.09***	0.47***	0.48***	0.76***	0.68***
	(1.121)	(1.248)	(2.557)	(2.711)	(2.635)	(2.709)	(5.740)	(4.119)
$Log(Idio.\ Risk)_{t-1}$	0.01	0.01	-0.08	-0.08	1.08***	1.09***	-0.35	-0.40
	(0.074)	(0.155)	(-1.142)	(-1.112)	(4.781)	(4.777)	(-1.322)	(-1.483)
$Log(Tenure)_{t-1}$	0.12	0.14	-0.04	-0.03	0.27	0.27	0.11	0.06
	(1.313)	(1.571)	(-0.593)	(-0.482)	(1.376)	(1.380)	(0.547)	(0.274)
$Leverage_{t-1}$	0.13	0.08	0.03	0.01	0.36	0.32	0.67	1.16
	(0.449)	(0.271)	(0.252)	(0.104)	(0.544)	(0.484)	(0.915)	(1.548)
$Shareholder\ return_t$	0.31*	0.31**	0.10	0.11	-0.29	-0.29	-0.54*	-0.57*
	(1.946)	(1.999)	(1.381)	(1.407)	(-0.896)	(-0.887)	(-1.778)	(-1.801)
Intercept	3.68***	3.55***	3.54***	3.49***	0.52	0.46	-1.87*	-1.17
	(8.073)	(7.697)	(11.761)	(11.622)	(0.496)	(0.427)	(-1.669)	(-1.060)
Observations	307	307	307	307	307	307	287	287
Adjusted R-squared	0.170	0.171	0.269	0.266	0.133	0.127	0.076	0.112

Panel C: UK Banks vs. EU Banks

	Log CEO Total Compensation		**Log CEO Salary**		**Log CEO Incentive Grants**		**Log CEO Deferred Bonus**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UK bank	0.41*	0.33	-0.06	-0.15	0.38	0.81**	0.13	-0.69
	(1.943)	(1.410)	(-0.722)	(-1.202)	(1.271)	(2.329)	(0.282)	(-1.201)
Post 2010		-0.34		-0.32*		0.75**		0.42
		(-1.355)		(-1.832)		(1.979)		(0.678)
UK bank x Post 2010		0.16		0.18		-0.96*		1.86**
		(0.414)		(0.876)		(-1.905)		(2.265)
$Log(Sales)_{t-1}$	0.24***	0.27***	0.22***	0.25***	0.05	0.01	0.25**	0.13
	(4.536)	(5.022)	(6.696)	(7.905)	(0.912)	(0.193)	(2.263)	(1.004)
$Book\ to\ market_{t-1}$	0.21***	0.23***	0.13**	0.14**	0.78***	0.77***	0.65***	0.54***
	(3.247)	(3.433)	(2.550)	(2.550)	(4.223)	(4.087)	(4.698)	(3.607)
$Log(Idio.\ Risk)_{t-1}$	-0.48***	-0.49***	-0.11	-0.12	-0.19	-0.16	0.40	0.40
	(-4.028)	(-3.930)	(-1.528)	(-1.614)	(-0.971)	(-0.803)	(1.337)	(1.362)
$Log(Tenure)_{t-1}$	0.05	0.05	0.04	0.05	-0.06	-0.06	0.20	0.15
	(0.481)	(0.504)	(0.797)	(0.842)	(-0.382)	(-0.334)	(0.857)	(0.695)
$Leverage_{t-1}$	-0.15	-0.25	-0.08	-0.17	-0.36	-0.28	1.23*	1.91**
	(-0.420)	(-0.700)	(-0.324)	(-0.687)	(-0.808)	(-0.642)	(1.677)	(2.501)
$Shareholder\ return_t$	0.03	0.05	-0.20*	-0.18*	-0.12	-0.15	-0.35	-0.41
	(0.116)	(0.194)	(-1.818)	(-1.668)	(-0.410)	(-0.523)	(-0.845)	(-0.928)
Intercept	3.55***	3.37***	3.02***	2.84***	-0.34	-0.17	-1.46	-0.26
	(6.056)	(5.613)	(10.257)	(9.182)	(-0.381)	(-0.183)	(-1.125)	(-0.189)
Observations	245	245	245	245	245	245	226	226
Adjusted R-squared	0.217	0.217	0.335	0.346	0.060	0.070	0.101	0.152

Table IA3: Effect of new regulation on systemic risk (full sample)

This table presents the results of OLS regressions to estimate the effect of new regulation on systemic risk for all banks in our sample. *ΔCoVaR* corresponds to contributions to systemic risk (*system*|*i*) or sensitivity to systemic risk (*i*|*system*). *VaR* is the measure of value at risk. *LRMES* measures the expected equity losses for a financial institution conditional on a prolonged market decline. *SRISK %* measures capital shortfall relative to the overall system. *UK bank* is equal to 1 for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. All other variables are defined in Appendix A. The sample period is 2006-2012. Panels A, B, and C use 110 year-observations corresponding to 26 UK banks (note that not all firms are present in all years due to mergers and failures). Tests in Panel A are for the UK market and include the largest UK FTSE 350 firms (1,054 firm-year observations). Panel B has matched US banks, which represent 116 bank-year observations. Panel C includes matched EU banks, which represent 66 bank-year observations. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level (Panel A) and robust standard errors (Panels B and C). ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: UK Banks vs. Other UK Firms

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$
	(1)	(2)	(3)
UK bank	0.16***	-0.34***	0.01
	(5.298)	(-5.421)	(0.092)
Post 2010	-0.24**	-0.54***	-0.06
	(-2.368)	(-4.231)	(-0.281)
UK bank x Post 2010	0.24***	0.56***	0.56***
	(6.593)	(10.431)	(6.101)
$Log(Sales)_{t-1}$	0.10*	0.21**	-0.14
	(1.870)	(2.956)	(-1.285)
Book to market $_{t-1}$	0.30**	1.03***	0.51*
	(2.288)	(3.943)	(1.969)
Leverage $_{t-1}$	-0.21	-0.36	0.42
	(-1.138)	(-0.956)	(0.499)
Industry Indicators	Yes	Yes	Yes
Observations	1,164	1,164	1,164
Adjusted R-squared	0.186	0.203	0.168

Panel B: Banks-specific comparisons of systemic risk (UK Banks vs. US Banks)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$	**LRMES**	**SRISK % (relative to system)**
	(1)	(2)	(3)	(4)	(5)
UK bank	-0.74***	0.92***	-1.01**	0.02	0.00**
	(-3.341)	(2.908)	(-2.054)	(0.877)	(2.175)
Post 2010	-0.46*	-0.54***	-1.24**	-0.02	-0.00*
	(-1.656)	(-2.620)	(-2.502)	(-0.998)	(-1.916)
UK bank x Post 2010	-0.75***	0.97***	-0.89*	0.01	0.00
	(-3.268)	(3.361)	(-1.731)	(0.584)	(0.808)
Log(Sales)$_{t-1}$	0.14**	0.15***	0.18**	0.02***	0.00***
	(2.344)	(3.409)	(2.074)	(4.697)	(6.871)
Book to market $_{t-1}$	-0.23	1.61**	-1.98*	0.02	0.00
	(-0.403)	(2.439)	(-1.679)	(0.228)	(0.306)
Leverage $_{t-1}$	0.99*	-0.73	2.22**	-0.17***	0.00
	(1.959)	(-1.385)	(2.319)	(-2.823)	(0.569)
Intercept	-0.16	-1.48**	2.77***	0.23***	-0.00***
	(-0.256)	(-2.234)	(2.733)	(3.447)	(-6.036)
Observations	249	249	249	136	136
Adjusted R-squared	0.124	0.162	0.043	0.188	0.404

Panel C: Banks-specific comparisons of systemic risk (UK Banks vs. EU Banks)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$	**LRMES**	**SRISK % (relative to system)**
	(1)	(2)	(3)	(4)	(5)
UK bank	-1.28	1.48***	0.47	0.02	-0.00***
	(-1.489)	(3.892)	(1.349)	(0.811)	(-3.495)
Post 2010	-0.12	1.17*	0.67*	0.08***	-0.00**
	(-0.160)	(1.872)	(1.816)	(2.843)	(-2.223)
UK bank x Post 2010	-0.77	1.56***	0.73*	0.01	-0.00***
	(-1.605)	(4.079)	(1.953)	(0.228)	(-4.160)
$Log(Sales)_{t-1}$	-0.20	0.17	0.04	0.03***	0.00***
	(-0.548)	(1.419)	(0.492)	(6.119)	(6.912)
Book to market $_{t-1}$	0.56	-0.31	-2.21***	-0.08*	-0.00***
	(0.700)	(-0.463)	(-3.841)	(-1.816)	(-2.949)
Leverage $_{t-1}$	1.82	0.11	1.11**	-0.13***	0.00**
	(0.978)	(0.170)	(2.534)	(-3.748)	(2.105)
Intercept	3.38	-1.24	3.84***	0.17**	-0.00***
	(0.781)	(-0.893)	(3.589)	(2.360)	(-3.265)
Observations	169	169	169	109	109
Adjusted R-squared	0.015	0.080	0.053	0.366	0.440

Table IA4: Effect of new regulation on systemic risk (parallel trends)

This table presents the results of OLS regressions to estimate the effect of new regulation on systemic risk. *ΔCoVaR* corresponds to contributions to systemic risk (*system*|*i*) or sensitivity to systemic risk (*i*|*system*). *VaR* is the measure of value at risk. *LRMES* measures the expected equity losses for a financial institution conditional on a prolonged market decline. *SRISK %* measures capital shortfall relative to the overall system. *UK bank* is equal to one for UK banks subject to the FSA Remuneration Code. We show all indicator variables for years relative to the start of the period in 2006. The year of change is 2010. All other variables are defined in Appendix A of the manuscript. The sample period is 2006-2012. Tests in Panel A are for the 10 largest UK banks and the 10 largest UK firms by asset size. Panels A, B, and C include 62 bank-year observations for the 10 largest UK banks. Panel B includes matched US banks, which represent 66 bank-year observations for the largest 10 US banks. Panel C includes matched EU banks, which represent 47 matched bank-year observations for the 10 largest EU banks. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level (Panel A) and robust standard errors (Panels B and C). ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: Dynamics of risk comparisons (Largest UK Banks vs. Other Largest UK Firms)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$
	(1)	(2)	(3)
UK bank	-0.47**	-0.88*	-0.20
	(-2.894)	(-2.261)	(-0.561)
2007	0.19	-0.12	0.51
	(1.222)	(-0.541)	(1.785)
2008	0.87**	2.29**	2.50***
	(2.762)	(3.180)	(4.802)
2009	0.47	1.78**	1.77***
	(1.656)	(2.708)	(3.770)
2010	-0.50**	0.19	0.28
	(-3.277)	(0.545)	(0.884)
2011	-0.53**	0.18	0.51
	(-3.286)	(0.465)	(1.402)
2012	-0.66***	0.49	0.92**
	(-5.137)	(1.170)	(3.087)
UK bank x 2007	-0.31	0.49*	-0.37
	(-1.909)	(2.120)	(-1.242)
UK bank x 2008	0.04	0.92	-0.39
	(0.118)	(1.273)	(-0.724)
UK bank x 2009	0.53	0.94	0.47
	(1.756)	(1.418)	(0.928)
UK bank x 2010	0.89***	1.21**	0.99**
	(5.601)	(3.341)	(2.920)
UK bank x 2011	0.85***	1.78***	0.89*
	(5.180)	(4.485)	(2.385)
UK bank x 2012	0.77***	0.69	0.44
	(5.464)	(1.599)	(1.266)
$Log(Sales)_{t-1}$	0.26***	0.29***	0.03
	(20.363)	(28.455)	(1.214)

Book to market $_{t-1}$	0.16	-0.87***	1.27***
	(1.148)	(-4.425)	(4.270)
Leverage $_{t-1}$	-0.39**	1.14***	-0.54*
	(-3.323)	(9.200)	(-2.035)
Industry Indicators	Yes	Yes	Yes
Observations	132	132	132
Adjusted R-squared	0.586	0.556	0.353

Panel B: Dynamics of banks-specific comparisons of systemic risk (Largest UK Banks vs. Largest US Banks)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$	LRMES	SRISK % (relative to system)
	(1)	(2)	(3)	(4)	(5)
UK bank	-0.60	0.39	-0.13	0.03	0.00
	(-1.500)	(0.840)	(-0.200)	(0.797)	(0.388)
2007	0.44	0.14	2.64**	-0.02	-0.00
	(0.625)	(0.169)	(2.207)	(-0.741)	(-0.311)
2008	3.71***	0.08	6.05***	0.08**	0.00
	(6.766)	(0.204)	(4.870)	(2.266)	(0.036)
2009	2.95***	-0.34	5.98***	0.13***	-0.00
	(6.706)	(-0.855)	(2.913)	(2.969)	(-0.052)
2010	1.13**	-0.60	1.90*	0.06**	-0.00
	(2.377)	(-1.621)	(1.871)	(2.433)	(-0.216)
2011	1.46***	-0.48	2.24*	-0.01	-0.00
	(3.009)	(-1.108)	(1.883)	(-0.220)	(-0.951)
2012	0.84*	-0.60	3.95**	0.05	-0.00*
	(1.806)	(-1.300)	(2.247)	(1.498)	(-1.832)
UK bank x 2007	-0.48	0.35	-2.35*	0.04	0.00
	(-0.665)	(0.376)	(-1.802)	(0.812)	(0.194)
UK bank x 2008	-2.78***	3.22***	-3.43**	-0.02	0.00
	(-4.711)	(3.644)	(-2.381)	(-0.410)	(0.792)
UK bank x 2009	-1.86***	3.14***	-2.92	-0.05	0.00
	(-3.832)	(3.607)	(-1.371)	(-0.952)	(0.989)
UK bank x 2010	-0.67	2.15***	0.17	-0.01	0.00
	(-1.333)	(3.546)	(0.133)	(-0.254)	(0.705)
UK bank x 2011	-0.88*	2.84***	-0.62	0.02	0.00
	(-1.799)	(3.696)	(-0.491)	(0.460)	(0.783)
UK bank x 2012	-0.41	2.10***	-1.71	0.02	0.00
	(-0.921)	(3.037)	(-0.936)	(0.498)	(0.809)
$Log(Sales)_{t-1}$	0.11*	0.07	0.12	0.02***	0.00***
	(1.873)	(0.838)	(0.779)	(3.822)	(6.351)
Book to market $_{t-1}$	-0.11	0.69	-5.37*	0.06	-0.00
	(-0.153)	(0.631)	(-1.672)	(0.767)	(-0.724)
Leverage $_{t-1}$	0.16	1.04	5.85**	-0.20***	0.00
	(0.270)	(1.019)	(2.189)	(-2.991)	(1.249)
Industry Indicators	No	No	No	No	No
Observations	128	128	128	106	106
Adjusted R-squared	0.714	0.516	0.234	0.330	0.393

Panel C: Dynamics of banks-specific comparisons of systemic risk (Largest UK Banks vs. Largest EU Banks)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$	LRMES	SRISK % (relative to system)
	(1)	(2)	(3)	(4)	(5)
UK bank	-3.65*	1.77***	-0.26	-0.07*	-0.00***
	(-1.765)	(2.757)	(-0.449)	(-1.710)	(-2.809)
2007	-0.30	0.55	-0.31	-0.06	0.00
	(-0.079)	(0.766)	(-0.433)	(-1.643)	(0.436)
2008	-2.24	-0.12	0.89	-0.04	-0.00
	(-0.457)	(-0.179)	(1.358)	(-0.731)	(-0.234)
2009	0.08	0.50	1.96***	0.03	-0.00
	(0.034)	(0.783)	(3.455)	(0.525)	(-0.388)
2010	1.35	0.20	1.14**	0.02	-0.00
	(0.587)	(0.286)	(2.030)	(0.509)	(-0.889)
2011	2.09	0.43	1.34*	0.02	-0.00*
	(1.013)	(0.606)	(1.965)	(0.521)	(-1.668)
2012	-3.47	5.96*	3.13*	0.09**	-0.00
	(-0.904)	(1.885)	(1.705)	(2.350)	(-0.728)
UK bank x 2007	0.55	-0.06	0.53	0.08	-0.00
	(0.144)	(-0.066)	(0.612)	(1.237)	(-0.475)
UK bank x 2008	3.32	3.43***	1.41	0.10	0.00
	(0.682)	(3.420)	(1.522)	(1.489)	(0.615)
UK bank x 2009	1.30	2.28**	0.59	0.05	0.00
	(0.550)	(2.335)	(0.612)	(0.770)	(0.720)
UK bank x 2010	-0.57	1.34	0.43	0.04	0.00
	(-0.257)	(1.659)	(0.484)	(0.881)	(1.144)
UK bank x 2011	-0.66	1.93**	0.20	-0.02	0.00
	(-0.300)	(2.185)	(0.222)	(-0.353)	(1.462)
UK bank x 2012	4.88	-4.52	-1.39	-0.02	0.00
	(1.255)	(-1.373)	(-0.683)	(-0.373)	(0.397)
$Log(Sales)_{t-1}$	-0.37	0.08	0.03	0.04***	0.00***
	(-0.711)	(0.505)	(0.215)	(5.474)	(6.116)
Book to market $_{t-1}$	-0.36	1.39***	-0.98**	-0.09*	-0.00***
	(-0.207)	(3.082)	(-2.224)	(-1.805)	(-2.875)
Leverage $_{t-1}$	1.85	0.65	1.77***	-0.13***	0.00
	(0.756)	(1.287)	(3.359)	(-2.946)	(1.259)
Industry Indicators	No	No	No	No	No
Observations	106	106	106	94	94
Adjusted R-squared	0.024	0.353	0.184	0.434	0.435

Table IA5: Effect of the new regulation on systemic risk (cross-sectional UK results)

This table presents the results of OLS regressions to estimate the effect of new regulation on systemic risk. *ΔCoVaR* corresponds to contributions to systemic risk (*system|i*) or sensitivity to systemic risk (*i|system*). *VaR* is the measure of value at risk. *LRMES* measures the expected equity losses for a financial institution conditional on a prolonged market decline. *SRISK %* measures capital shortfall relative to the overall system. *UK bank* is equal to one for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. The *Number of Contract Changes (weighted)* is defined as the number of contractual features that change in a given component of compensation scaled by the number of contractual features present in that component at the beginning of the year, summed across the components with weights applied as the proportion that the corresponding compensation component represents in total pay. *Contract Change (indicator)* is an indicator variable that takes the value of one if a contract has any change relative to the prior year. The *Number of Contract Changes (number)* is the unweighted total number of contract changes in a given year. All other variables are defined in Appendix A of the revised manuscript. IDS data coverage of option-based compensation starts in 2007; therefore, our sample in this analysis includes 2008 to 2012 to allow us to compute changes in contractual features. Tests in Panel A are for the 10 largest UK banks and the 10 largest other UK firms by asset size and include 62 bank-year observations for the 10 largest UK banks. Panel B presents the results for the full UK sample, consisting of 75bank-year observations for UK banks consisting of 26 UK banks. Panels C and D show the results for the indicator variable for contract changes (Panel C) and the total count of contract changes (Panel D) for the 10 largest UK banks and the 10 largest UK firms by asset size and include 62 bank-year observations for the 10 largest UK banks. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of *t*-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Panel A: UK Banks vs. Other UK Firms (Largest UK Banks vs. Largest Other UK Firms)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$
	(1)	(2)	(3)
UK bank	0.25***	0.83***	0.63***
	(3.720)	(14.740)	(13.430)
Post 2010	-0.98***	-0.96***	-0.88***
	(-6.751)	(-20.735)	(-23.804)
UK bank x Post 2010	0.03	-0.50***	0.14***
	(0.207)	(-8.068)	(4.820)
Number of contract changes (weighted)	-0.17***	-0.49***	-0.28*
	(-3.784)	(-4.344)	(-2.394)
Number of contract changes (weighted) x Post 2010	-0.00***	-0.00**	-0.00***
	(-4.723)	(-2.570)	(-14.570)
UK bank x Number of contract changes (weighted)	-0.17***	0.21***	0.12***
	(-25.178)	(10.683)	(7.196)
UK bank x Number of contract changes (weighted) x Post 2010	0.33***	0.07***	-0.34***
	(24.476)	(3.710)	(-20.945)
$Log(Sales)_{t-1}$	0.28***	0.37***	0.14***
	(18.103)	(52.465)	(6.338)
Book to market $_{t-1}$	-0.19	-1.53**	0.76**
	(-1.155)	(-2.722)	(2.518)
Leverage $_{t-1}$	-0.27***	1.63***	-0.25*
	(-4.873)	(4.725)	(-2.004)
Industry Indicators	Yes	Yes	Yes
Observations	114	114	114
Adjusted R-squared	0.563	0.433	0.234

Panel B: UK Banks vs. Other UK Firms

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$
	(1)	(2)	(3)
UK bank	0.81***	0.66***	-0.20**
	(15.549)	(6.318)	(-2.278)
Post 2010	-0.35***	-0.69**	-1.18***
	(-3.118)	(-2.471)	(-6.126)
UK bank x Post 2010	-0.43***	-0.14	0.27**
	(-9.856)	(-0.976)	(2.873)
Number of contract changes (weighted)	0.02	0.00	0.02
	(0.387)	(0.024)	(0.193)
Number of contract changes (weighted) x Post 2010	0.00	-0.00**	0.00***
	(0.257)	(-2.785)	(3.530)
UK bank x Number of contract changes (weighted)	-0.19***	-0.08**	0.19***
	(-13.431)	(-2.870)	(8.010)
UK bank x Number of contract changes (weighted) x Post 2010	0.18***	-0.17	-0.25***
	(4.196)	(-1.448)	(-4.683)
$Log(Sales)_{t-1}$	0.10	-0.21	0.14
	(1.511)	(-1.645)	(1.725)
Book to market $_{t-1}$	0.23	0.22	0.76**
	(1.247)	(0.758)	(2.319)
Leverage $_{t-1}$	-0.10	0.71	0.02
	(-0.434)	(0.798)	(0.042)
Industry Indicators	Yes	Yes	Yes
Observations	832	832	832
Adjusted R-squared	0.228	0.274	0.311

Panel C: UK Banks vs. Other UK Firms (Largest UK Banks vs. Largest Other UK Firms, an indicator variable for contract changes)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$
	(1)	(2)	(3)
UK bank	-0.19	0.03	-0.75***
	(-1.154)	(0.144)	(-19.230)
Post 2010	-1.04***	-2.22***	-1.93***
	(-5.587)	(-8.312)	(-14.267)
UK bank x Post 2010	0.49**	1.98***	3.22***
	(3.209)	(7.597)	(24.505)
Contract change (indicator)	-0.15	-0.50*	-0.21***
	(-1.089)	(-1.985)	(-9.564)
Contract change (indicator) x Post 2010	-0.32**	-0.44	0.29***
	(-2.491)	(-1.772)	(15.008)
UK bank x Contract change (indicator)	-0.06	1.02**	0.66***
	(-0.581)	(3.683)	(5.967)
UK bank x Contract change (indicator) x Post 2010	0.34**	-1.45***	-2.38***
	(3.549)	(-5.159)	(-18.585)
$Log(Sales)_{t-1}$	0.27***	0.34***	0.11***
	(18.264)	(27.204)	(4.279)
Book to market $_{t-1}$	-0.55	-0.40**	2.06***
	(-1.913)	(-2.953)	(4.360)
Leverage $_{t-1}$	-0.11	0.27	-1.65***
	(-0.720)	(1.917)	(-4.058)
Industry Indicators	No	No	No
Observations	113	113	113
Adjusted R-squared	0.480	0.385	0.161

Panel D: UK Banks vs. Other UK Firms (Largest UK Banks vs. Largest Other UK Firms, unweighted number of contract changes)

	$\Delta CoVaR^{system\|i}_{99\%,t}$	$\Delta CoVaR^{i\|system}_{99\%,t}$	$VaR^{i}_{99\%,t}$
	(1)	(2)	(3)
UK bank	-0.37***	-0.66***	-0.43***
	(-3.919)	(-12.621)	(-4.263)
Post 2010	-1.02***	-0.94***	-0.67***
	(-7.190)	(-15.039)	(-7.543)
UK bank x Post 2010	0.70***	0.90***	1.07***
	(5.531)	(13.676)	(14.389)
Number of contract changes (number)	-0.04	-0.13	0.03
	(-0.650)	(-1.198)	(0.225)
Number of contract changes (number) x Post 2010	-0.07	0.28**	0.07
	(-1.144)	(2.515)	(0.547)
UK bank x Number of contract changes (number)	0.05	0.01	-0.21
	(1.289)	(0.148)	(-1.543)
UK bank x Number of contract changes (number) x Post 2010	0.11**	0.08	-0.28*
	(3.195)	(0.865)	(-2.114)
$Log(Sales)_{t-1}$	0.28***	0.36***	0.10***
	(23.689)	(56.274)	(5.698)
Book to market $_{t-1}$	-0.06	-1.33***	1.03**
	(-0.518)	(-4.040)	(3.533)
Leverage $_{t-1}$	-0.48***	0.84***	-0.80***
	(-14.500)	(4.525)	(-9.874)
Industry Indicators	No	No	No
Observations	132	132	132
Adjusted R-squared	0.445	0.253	0.099

Table IA6: Effect of the new regulation on risk-taking (cross-sectional UK results)

This table presents the results of OLS regressions to estimate the effect of new regulation on risk using the idiosyncratic measure of volatility (*Idiosyncratic risk*) computed from the market model, *Total Volatility*, *Leverage*, *Z-score* (as a measure of default risk), and *CDS spread* (5-year average annual credit default spread) for the UK sample. *UK bank* is equal to one for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. The *Number of Contract Changes (weighted)* is defined as the number of contractual features that change in a given component of compensation scaled by the number of contractual features present in that component at the beginning of the year, summed across the components with weights applied as the proportion that the corresponding compensation component represents in total pay. The coefficients on the interaction of the number of contract changes are in percentage terms for ease of interpretation. All other variables are defined in Appendix A of the revised manuscript. IDS data coverage of option-based compensation starts in 2007; therefore, our sample in this analysis includes 2008 to 2012 to allow us to compute changes in contractual features. Tests are for the UK market and use 75 bank-year observations for UK banks consisting of 26 UK banks (note that not all firms are present in all years due to mergers and failures) and other largest UK FTSE 350 firms (1,007 firm-year observations). For CDS spread data, we have 11 UK bank-year observations for the largest UK banks with available data. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of t-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

	Idiosyncratic Risk	**Total Volatility**	**Leverage**	**Z-score**	**CDS-spread**
	(1)	(2)	(3)	(4)	(5)
UK bank	0.06***	0.06***	0.07***	0.08*	0.00***
	(6.742)	(5.809)	(13.119)	(1.890)	(3.501)
Post 2010	-0.15***	-0.19***	-0.07***	0.29***	0.00
	(-7.475)	(-7.170)	(-7.472)	(3.779)	(0.003)
UK bank x Post 2010	-0.04**	-0.07***	0.03***	-0.11	-0.01**
	(-2.793)	(-3.532)	(4.299)	(-1.269)	(-2.955)
Number of changes (weighted)	-0.04***	-0.05***	-0.01	0.03	-0.01**
	(-3.632)	(-4.479)	(-0.657)	(0.731)	(-2.991)
Number of changes (weighted) x Post 2010	-0.02	-0.02	0.01	0.02	-0.00
	(-1.287)	(-1.173)	(0.175)	(0.089)	(-0.097)
UK bank x Number of changes (weighted)	0.58***	0.55***	-0.34***	-1.43***	-0.03***
	(12.729)	(12.363)	(-8.703)	(-6.969)	(-5.768)
UK bank x Number of changes (weighted) x Post 2010	-0.70***	-0.68***	-0.07	0.16	-0.02
	(-15.190)	(-13.310)	(-1.346)	(0.486)	(-0.362)
$Log(Sales)_{t-1}$	-0.03***	-0.01	0.00	0.09***	-0.00**
	(-4.417)	(-1.258)	(0.405)	(4.460)	(-2.617)
Book to market $_{t-1}$	0.01	0.01	0.08***	0.06	0.00
	(1.098)	(0.962)	(3.090)	(0.325)	(0.784)
Leverage $_{t-1}$	0.14***	0.11*	0.47***	0.42*	0.00
	(3.044)	(1.893)	(6.263)	(1.912)	(0.605)
Industry Indicators	Yes	Yes	Yes	Yes	Yes
Observations	1,082	1,082	1,082	1,020	226
Adjusted R-squared	0.453	0.448	0.496	0.279	0.159

Table IA7: Effect of the new regulation on the sensitivity of equity-based compensation (cross-sectional UK results)

This table presents the results of OLS regressions to estimate CEOs' pay sensitivity to performance. *Vega* is the natural logarithm of the partial derivative of the value of the CEO's portfolio of options to changes in the annual standard deviation of equity returns multiplied by 0.01 to attain the dollar change in CEO wealth associated with a 1% change in the standard deviation of the firm's annual returns. *Wealth* is the natural logarithm of the CEO's total market value of equity holdings and equity incentives in a given year. *Delta* is the natural logarithm of the dollar change in CEO wealth generated by a 1% increase in the stock price. *UK bank* is equal to 1 for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. The *Number of Contract Changes (weighted)* is defined as the number of contractual features that change in a given component of compensation scaled by the number of contractual features present in that component at the beginning of the year, summed across the components with weights applied as the proportion that the corresponding compensation component represents in total pay. All other variables are defined in Appendix A of the revised manuscript. IDS data coverage of option-based compensation starts in 2007; therefore, our sample in this analysis includes 2008 to 2012 to allow us to compute changes in contractual features. Tests are for the UK market and use 75 bank-year observations for UK banks consisting of 26 UK banks (note that not all firms are present in all years due to mergers and failures) and other largest UK FTSE 350 firms. To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. Values of t-statistics (reported in parentheses) are computed based on robust standard errors clustered at the industry level. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

	Vega	**Wealth**	**Delta**
	(1)	(2)	(3)
UK bank	0.29***	-0.71***	1.65***
	(6.813)	(-3.903)	(20.706)
Post 2010 indicator	0.13	0.35	0.06
	(1.406)	(1.437)	(0.724)
UK bank x Post 2010	1.44***	0.82***	0.94***
	(54.158)	(3.519)	(14.131)
Number of changes (weighted)	0.04	-0.29	-0.02
	(0.843)	(-1.443)	(-1.197)
Number of changes (weighted) x Post 2010	0.00	0.00***	0.00
	(0.724)	(3.204)	(0.188)
UK bank x Number of changes (weighted)	0.41***	0.60***	0.39***
	(13.273)	(9.781)	(8.393)
UK bank x Number of changes (weighted) x Post 2010	-0.14*	-0.39***	0.28***
	(-1.774)	(-3.312)	(4.673)
$Log(Sales)_{t-1}$	-0.08	0.47***	-0.13
	(-1.335)	(4.303)	(-1.577)
$Book\ to\ market_{t-1}$	-0.31***	-0.06	-0.48***
	(-13.167)	(-0.416)	(-13.563)
$Log(Idio.\ Risk)_{t-1}$		-0.10	-0.22***
		(-0.315)	(-3.442)
$Log(Tenure)_{t-1}$	0.06	1.20***	0.06
	(1.274)	(6.011)	(1.316)
$Leverage_{t-1}$	1.50*	-3.14***	2.37*
	(1.966)	(-6.216)	(2.101)
Industry Indicators	Yes	Yes	Yes
Observations	1,039	1,039	1,039
Adjusted R-squared	0.271	0.192	0.327

Table IA8: Effect of the new regulation on CEO turnover (cross-sectional UK results)

This table presents conditional logistic regression to estimate the effect of new regulation on the likelihood of CEO turnover. The *Number of Contract Changes (weighted)* is defined as the number of contractual features that change in a given component of compensation scaled by the number of contractual features present in that component at the beginning of the year, summed across the components with weights applied as the proportion that the corresponding compensation component represents in total pay. *UK bank* is equal to 1 for UK banks subject to the FSA Remuneration Code. *Post 2010* takes the value of 1 for years starting from 2010. All other variables are defined in Appendix A of the revised manuscript. IDS data coverage of option-based compensation starts in 2007; therefore, our sample in this analysis includes 2008 to 2012 to allow us to compute changes in contractual features. The sample includes information for CEOs with partial years and does not impose restrictions on all variables being available as in other tables. Column (1) shows results for the UK market and uses 77 bank-year observations corresponding to 26 UK banks (note that not all firms are present in all years due to mergers and failures) and other largest UK FTSE 350 firms (1,081 firm-year observations). To mitigate the effects of extreme observations, all continuous variables are winsorized at the 1% and 99% tails of their respective distributions in each sample year. The values of *z*-statistics (reported in parentheses) are computed based on robust standard errors. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

	UK Banks vs. UK Firms
	(1)
UK bank	0.48***
	(6.516)
Post 2010	-0.19
	(-1.201)
UK bank x Post 2010	0.42***
	(2.735)
Number of changes (weighted)	0.01
	(0.044)
Number of changes (weighted) x Post 2010	0.00
	(0.555)
UK bank x Number of changes (weighted)	-0.19***
	(-7.193)
UK bank x Number of changes (weighted) x Post 2010	0.14***
	(5.616)
Shareholder return $_{t-1}$	0.10
	(0.990)
ROA $_{t-1}$	-2.07***
	(-3.617)
Book to market $_{t-1}$	0.24***
	(3.278)
Log(Tenure) $_{t-1}$	-0.43***
	(-2.932)
Age $_{t}$	0.04**
	(2.221)
Industry Indicators	Yes
Observations	1,081
Pseudo R-squared	0.0362

Table IA9: Market reaction tests to UK and EU compensation regulation

This table presents the results from estimating the market reaction to the 17 regulatory events concerning executive compensation for financial institutions in the UK and the EU. Cumulative abnormal returns computed around the day of the announcement (-1,+1) are relative to the UK FTSE All-Share value-weighted market index. Raw CDS spread results are for the 5-year CDS contracts for which data is available. The results are insensitive to the choice of the reference market index measure as well as to the usage of a global index. *Size* is the natural logarithm of market value, *Book to market* is the ratio of book value to market value, and *Momentum* is the market-adjusted return for a given stock in the sample over the previous 60 days. All variables are defined in Appendix A. The events are summarized below in column (3). The values of *t*-statistics (reported in parentheses) are computed based on robust standard errors. ***, **, * designate significance at 1%, 5% and 10% levels, respectively.

Events	Date	Legislative or regulatory event	CAR		CDS spread	
			UK Banks	All UK without UK banks	UK Banks	All UK without UK Banks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	2/26/2009	FSA proposes its Remuneration Code (potentially applicable to 40-50 UK banks)	0.0504***	0.0211***	-0.0315***	0.1165***
2	8/12/2009	FSA publishes its final version of the Remuneration Code (applicable to 26 UK banks)	-0.011***	0.0011	-0.0095***	0.0898***
3	1/1/2010	Remuneration Code becomes effective (retroactively applies to all compensation granted in 2010 that relates to 2009 performance, applicable to 26 UK banks)	0.0138***	0.0031***	-0.0021*	0.0604***
4	6/30/2010	EU proposes to introduce tougher regulations for financial institutions' employees compensation	-0.0041	-0.0167	-0.0041**	0.0085
5	7/29/2010	FSA proposes a revised version of the Remuneration Code with wider application to more than 2,500 financial institutions	0.0096***	-0.0243*	-0.0003	0.0317***
6	10/8/2010	CEBS introduces guidelines that are tougher than the Remuneration Code and require deferral of up to 60% of variable pay	0.0083***	0.0000	-0.0008	0.0490***
7	12/10/2010	EU proposes to introduce tougher regulations	-0.0051	0.0037***	0.0035**	0.0517***
8	12/17/2010	FSA publishes the revised version of the Remuneration Code with wider application to more than 2,500 financial institutions	-0.0092***	0.0043***	0.0028	0.0487***
9	1/1/2011	Revised Remuneration Code becomes effective (applies to compensation relating to 2010 performance)	0.0037***	0.0025***	-0.0035	0.0646***
10	5/15/2012	EU proposes bonus caps	-0.0009	0.0013*	0.0032	0.0432***
11	2/27/2013	EU announces the decision to cap bonuses at 1x salary (with 2x max variable component if approved by the supermajority of shareholders)	-0.0225***	-0.0003	-0.0036*	0.0359***
12	9/25/2013	UK appeals the bonus cap decision	-0.0009	0.0000	-0.0020	0.0303***
13	6/12/2013	UK Parliamentary Commission on Banking Supervision standards proposes stricter rules	-0.0181***	-0.0034***	-0.0015	0.0420***
14	10/24/2013	FSA announcement of proposals to implement the UK Parliamentary Commission recommendations	-0.0006	-0.0032***	-0.0028*	0.0249***

Events	Date	Legislative or regulatory event	CAR		CDS spread	
			UK Banks	All UK without UK banks	UK Banks	All UK without UK Banks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15	1/1/2014	Bonus caps are in effect	0.0096***	0.0006	-0.0016	0.0228***
16	3/13/2014	UK proposes bonus clawbacks (more restrictive than EU)	-0.0008	0.0096	-0.0022**	0.0203***
17	11/20/2014	UK drops appeal against bonus caps	-0.0049**	-0.0060***	-0.0055***	0.0012
Observations			91	1,469	30	721