# Executive Compensation and Competition in the Banking and Financial Sectors.

Vicente Cuñat
Universitat Pompeu Fabra

Maria Guadalupe*
Columbia University
CEPR

**Abstract**

This paper studies the effect of product market competition on the compensation packages that firms offer to their executives and in particular its impact on the sensitivity of pay to performance. To measure the effect of competition we use two different identification strategies on a panel of US executives. We exploit two deregulation episodes in the banking and financial sectors as quasi-natural experiments. We provide difference in differences estimates of the effect of competition on estimated performance-pay sensitivities and on the sensitivity of stock option grants. Our results indicate that a higher level of product market competition increases the performance pay sensitivity of executive compensation schemes.

JEL codes: M52, L1, J31

Keywords: Executive compensation; product market competition; performance related pay.

## 1 Introduction

A large amount of effort and literature has been devoted to understanding the determinants of executive compensation. The availability of detailed data and the belief that firms can greatly improve their performance by setting the right incentives has induced researchers to search for complex compensation packages in the spirit of principal-agent theory (Holmstrom 1979; Mirrlees 1976; 1974). The empirical literature on the topic (see Murphy 1999 for an extensive survey) has underlined the sharp increase over the 80s and 90s in performance pay sensitivities and in the use of stock options, that dominate compensation packages for

*We would like to thank Heski Bar-Isaak, Ken Troske, Maia Güell, Steve Machin, Marco Manacorda, Sendhil Mullainathan, Steve Nickell, Steve Pischke, John Van Reenen and participants at seminars in LSE, MIT, UPF and IZA for helpful comments. Any remaining errors are our sole responsibility. Corresponding author: Maria Guadalupe, maria_g@mit.edu

many executives (Hall and Liebman 1998; Murphy 1999). However, there is little work on the effect of the competitive environment on how compensation contracts are designed. It is likely that the structure of the product market and in particular the degree of product market competition that the firm faces when trying to sell its products affects the incentives of executives and therefore the optimal type of contracts that the firm should offer.

A number of theoretical papers have analyzed the expected effects of changes in product market competition on incentives and contracts. Our aim with this paper is to assess this question empirically. This is a relevant question not only to understand how the economic environment and the degree of competition affects the structure of performance pay contracts and incentive provision, but also because given the increase in product market competition through different channels (from deregulation to technological change and increased trade) over the past decades it may provide a potential explanation for the increased reliance on performance related pay in executive compensation packages.

Product market competition may have an effect on managerial compensation through the following channels. In the first place competition changes the elasticity of the profits of the firm to increases in productivity. Therefore it changes the returns to effort of the executives of the firm (Schmidt, 1997; Raith, 2003) and following a change in the competitive environment, firms may decide to re-optimize their compensation packages.

Secondly, competition changes the risk and implicit incentives that the economic environment provides to managers and accordingly, it may change the optimal explicit incentive package that firms offer to them (Schmidt, 1997). In a similar vein a number of papers (Hart, 1983; Scharfstein, 1988; and Hermalin, 1992) stress that more competitors may actually improve the information available to principals on the effort exerted by managers and therefore the degree of agency problems. Finally, and possibly departing from the standard principal-agent approach, changes in competition may alter the profit levels of the firm, the relative bargaining power and the incentives for managers to extract rents from the firm (Bebchuk, Fried and Walker, 2002; Bertrand and Mullainathan, 2001).

To achieve our goal of measuring the net effect of competition through these channels we estimate individual compensation equations that take into account the theoretical structure of the incentive contracts and the fact that competition may be systematically correlated with the unobserved component of wages if individuals sort themselves into different sectors according to the degree of competition.

However, since our ultimate purpose is to isolate the causal effect of competition on the

sensitivity of pay to performance, the crucial issue in the analysis will be the measure of competition used. Even though most economists may agree on a definition of a perfectly competitive market, or a monopoly, problems arise when trying to find a measure of the degree of competition that is unanimously accepted. We use two alternative measures of competition to overcome this problem. These correspond to two important deregulation waves in US financial markets, that we use as quasi-natural experiments. These deregulation episodes are exogenous sources of competition in the form of lower barriers to entry that affect particular sectors on particular sample years. We obtain a difference in differences estimator for the change in slope of pay performance contracts following deregulation and check its robustness to different specifications. We also estimate the impact of the deregulation on the sensitivity of stock options granted. The results show that a higher level of product market competition increases the performance pay sensitivity of executive compensation schemes. We finally assess whether firms with good corporate governance react differently to the increase in competition relative to firms with worse corporate governance. The results on this last part are however inconclusive.

The added value of our work is therefore to clarify the direct effects of changes in the competitive environment following these deregulations on the compensation packages offered to executives. Our results are based on a panel of executives and provide difference in differences estimates of the change in sensitivities using two important deregulations as our experiments of a change in the competitive environment. This is a relatively unexplored question at an empirical level even though a number of theoretical papers have implications regarding this interaction. The consequences in terms of understanding and explaining executive compensation, the recent increased reliance on stock options and the increases in sensitivities are important implications of the paper.

## 2 Theory and Existing Evidence

The closest theoretical contributions to our empirical problem are the models by Schmidt (1997) and Raith (2003). In these papers, the effect of competition comes from its effect on the profit distribution. In Schmidt (1997) the explicit contract signed by a risk neutral principal (shareholders) and a risk averse agent that can exert effort in cost-cutting activities (CEO, executive) is influenced by the implicit incentives given by the competitive environment of the firm. Competition affects the contract offered to the agent through two channels. On the one hand, a higher level of competition will increase the marginal profit to

cost-cutting activities, (for instance if the elasticity of substitution between goods is higher) and therefore the contract will provide steeper incentives to induce the manager to exert more effort as the profit of stealing market share from other firms increases. On the other hand a higher level of competition will reduce the average profits of the firm and therefore increase the likelihood of bankruptcy. If managers are worried about this bankruptcy they will exert more effort, so there is less need for an explicit contract that induces effort and therefore one should expect a contract with flatter incentives. Overall, the effect of an increase in competition is ambiguous.

Raith (2003) has a variation on this model that eliminates the ambiguity. By allowing entry and exit, endogenous exit guarantees that the average profits do not drop like in Schmidt's model, so the first effect dominates and we should expect steeper incentives associated to more competition due to more profitable market stealing activities. The objective of our work is to have a clear measure of the total effect of a change in competition.

An earlier literature that studied the impact of competition on managerial incentives focused on the role of competition on information. Hart (1983) assumes that the role of competition is to tie the actions of managers more closely to the rest of the market and obtains that increased competition reduces managerial slack. Scharfstein (1988) shows that this result is very sensitive to the assumptions made and Hermalin (1992) frames this result in a more general setting. In these papers the increase in competition is modelled as an increase in market transparency and therefore in the degree of agency, whereas in Raith and Schmidt the effect arises through the fact that competition changes profits and the way they react to the effort exerted by the agent. We will see in the empirical analysis how the effect of competition interacts with the degree of corporate governance to try and shed some light on the informational hypothesis.

A fall in competition may increase the explicit incentives provided in executive contracts to compensate for the reduction in incentives produced by a fall in the bankruptcy risk, however this is not the only mechanism for this correlation. Bebchuk, Fried and Walker (2002) explore the evidence in the existing literature for rent extracting activities in managerial compensation. They find a number of puzzles that cannot be explained using the standard principal agent theory but could be consistent with rent extraction explanations. In principle one could expect that if executives are risk averse, most of the rent extraction activities would be done through the fixed part of the compensation. However, for "camouflage" reasons we may also observe some rent extraction in the variable part of compensation.

Bertrand and Mullainathan (2001) calculate a measure of "pay for luck" associated with rent extraction activities on the performance based component of executive compensation packages. They find positive rent extraction on the variable component and that this pay for luck is more intense in firms with bad governance.

An important point when assessing the incentives of any compensation package is to assess the role of the fixed component of pay. In this sense the efficiency wages theory claims that this part should have a discipline effect. One of the various possible reasonings for this incentive is that the fear of losing their job would discipline managers and this discipline effect will be larger the larger the fixed pay that they receive. To capture these effects we will not only measure the interaction of the slope of the compensation packages with the competition measures but also the effect of competition on the fixed component of pay. Although we will interpret some of the results on the basis of rent extraction, some of them can equally be reinterpreted in terms of efficiency wages and voluntary rent sharing by the principal/employer (Shapiro and Stiglitz, 1984).

The empirical papers that relate product market competition and executive compensation are mostly in the line of Aggarwal and Samwick (1999), Kedia (2003) and Joh (1999). These papers introduce explicitly strategic considerations and the structure of the product market in managerial compensation to address the relative performance evaluation puzzle (the fact that empirical studies seem not to find any role for relative performance evaluation in incentive contracts). In particular they argue that principals will commit to particular compensation structures to soften or increase the aggressiveness of their managers in the output market. In their setting competition is endogenous to the compensation setting structure. This paper departs from their approach in the sense that we want to identify a causal effect from product market competition to executive compensation; the causal effect provided by the deregulations goes in one direction only (from competition to contracts). This is because our measures of competition are used as exogenous shocks, as changes in the competitive environment in which firms operate. Furthermore, the empirical analysis will also explicitly address to what extent the effect on performance-pay sensitivities comes from changes in relative performance evaluation.

Other related empirical literature analyses the effect of regulatory constraints on compensation. Joskow et al. (1993; 1996) compare the different executive pay packages used in different industries. They find that regulated utilities pay lower wages than the unregulated sectors. They also find some limited evidence that they provide less sensitive compensa-

tion packages Finally, Hubbard and Palia (1995) and Crawford et al. (1995) analyze the effect on compensation of different banking deregulation in the eighties. Hubbard and Palia (1995) use the state by state banking deregulations and exploit the fact that different states were deregulated in different years. They thus provide difference in differences estimates of deregulation on the *level* of compensation and find that compensation increased after the deregulation; they find no significant effects on the *slope* of the incentive contracts. However their estimator for that slope is not specified as a difference in differences and therefore does not take into account that the sensitivities may have been higher throughout the sample period in the banking sector. Crawford et al. (1995) using a sample of banks estimate the change in level and slope of CEO compensation contracts following the 1982 Garn-St.Germain Depository Institutions Act. They find no effect on the level of compensation and a positive effect on its slope. However, once again the estimated effects are not specified as difference in differences because there is no control sample (they just evaluate the effect of before/after 1982 for banks). This does not take into account that compensation levels and slopes may have been trending over the sample period. We explicitly address these issues in our empirical analysis by using a difference in differences estimator that takes into account both the trends over time and the pre-existing differences across sectors in terms of compensation packages.

# 3 Specification and identification strategy

We use two alternative specifications in our estimations. The first one is based on the fact that one can estimate directly the sensitivity of pay to performance from data on total compensation and firm performance. The second specification relies on the fact that the sensitivity of stock option grants to firm value can be explicitly calculated. We estimate how these sensitivities change with product market competition.

Throughout the analysis we use the Standard & Poor's Execucomp dataset. This is a panel dataset that covers the top 5 executives (ranked by salary and bonus) of all the firms included in the Standard & Poor's 1500 index. We use yearly data from 1992 to 2002[1]. It records exhaustive data on executive compensation schemes as well as some individual characteristics[2]. The individual level data on compensation includes yearly wage, bonus, stock

[1]The index includes firms in the S&P 500, S&P MidCap 400, and S&P SmallCap 600 Indices so it represents a stratified sample of quoted firms of all sizes. Only the first quarter of 2002 is used because of data availability.

[2]Individual characteristics such as age and tenure are only available for a very limited number of obser-

options and other compensation. The data also contain information on firm characteristics and performance that will be used in the analysis such as total assets, sales, earnings before interest and taxes, total market return (dividend plus appreciation) of holding all stock during the year. The full sample for the basic specification contains 20,645 observations that correspond to 6,202 individuals.

In what follows we provide the detail of the specifications and discuss the source of identification. However, before doing so it is important to discuss the source of increased product market competition exploited in the paper. In fact a crucial feature of the analysis is the measure of product market competition used. Previous research that uses standard concentration ratios or Herfindahl indices can be subject to a number of criticisms. First, concentration is a very imperfect measure of the competitiveness of the sector. This is both because there are measurement issues on how these ratios should be computed (concentration is typically measured on a national basis and this may be of little relevance for sectors that compete internationally) and because what they actually capture is not clear cut (in many standard competition models an increase in competition is associated with a fall in the number of firms in equilibrium). Second, concentration may be a response to the way in which compensation is set in the sector and hence be endogenous, or it may be correlated with some omitted variable. That is why we use two alternative measures of changes in the competitive regime in which firms operate. These exploit two main acts passed in the US in the nineties to deregulate the financial services that are used as quasi-natural experiments.

### 3.1 Two quasi-natural experiments: financial deregulation in the 90s

The decade of the 1990s is thought of as the major deregulation period for the financial sector in the United States. Two major acts were implemented that were designed to foster competition in the financial sector. They constitute natural experiments that affect only particular industries after a given year and therefore can be used to identify the effects of competition.

The first one was the 1994 Riegle-Neal Interstate Banking and Branching Efficiency Act (RNA) that repealed two previous amendments that curtailed interstate banking. It implied that banks were allowed to own and operate branches in different states thus generating a fall in entry barriers and hence an increase in product market competition. Prior to that there were restrictions for banks to operate across borders, although there were limited bi-

vations, and the criteria of selection are not clear, so we decided not to include them.

lateral agreements between some states prior to this act. Several papers explore how these previous bilateral deregulation agreements affected bank performance. Stiroh and Strahan (2003) show that deregulation led to a reallocation of assets that moved towards more efficient banks. After deregulation relative performance became a much better predictor of future market share. It also changed the exit dynamics of the banking sector leading to a higher rate of exit. These results are consistent with the view that deregulation can be seen as a decrease in barriers to entry and a subsequent increase in competition. Furthermore deregulation lead to reductions in costs and prices of banking services (Jayaratne and Strahan, 1998) and an increase in the growth rates of banks (Jayaratne and Strahan, 1996). De Young et al. (1998) show how entry in deregulated states lead to a decrease in cost efficiency of small urban banks in the short run but generated cost efficiency gains in the long run (six or more years). Nichols and Hendrickson (1997) show the impact of previous deregulation waves from 1929 to 1989 using Canadian banks as a benchmark for US reforms and vice versa. The freedom to establish new branches seems to have contributed to higher levels of efficiency.

The Riegle-Neal Act meant a nationwide lowering of barriers. For banks that already operated in states that had some deregulation agreements the RNA meant that they could now also operate in states that had not previously agreed to lower their barriers to entry, experiencing an increase in their potential market. For banks operating in states that had not previously deregulated, the RNA meant, on top of the increase of the relevant market, an increase in the potential competitors in the form of new entrants from other states. Both effects can be seen as an increase in competitive pressure. While the empirical literature on the effective impact of this reform is still limited, the fact that this is the most wide-ranging reform of the kind for the US (since it affects the whole country) suggests that the impact of the deregulation was very large. This is the first natural experiment used for the 1994 turning period. We compare the years before 1994 (period 1992-1994) to those after 1994 (1995-1998).

The second major reform to the financial industry regulation was brought about in 1999 with the Gramm-Leach-Bliley Act (GLBA) also known as the financial services modernization act. This repealed previous legislation (dating from the great Depression in the 1930s) that imposed barriers separating traditional banking, insurance and securities underwriting into three distinct industries which in practice meant that banks and investment firms were not competing with each other. This second deregulation seemed to be a crucial step

towards establishing universal banking in the US: "The reforms culminated in the passage of the Gramm-Leach-Bliley act of 1999, which established financial holding companies as a platform for building the global, universal US banks of the next generation." (Calomiris, 2002.)

The perception that the GLBA would change the market structure of the financial sector can be seen in the share price reaction of the affected firms. Carow and Heron (2002) find that there was a significant price reaction on the stocks of firms that were involved in the deregulation. Firms belonging to major sectors that were likely to increase their target markets (insurance companies and investment banks) experienced positive abnormal returns while more specialized firms that could see their narrow business niches under threat (thrifts and finance companies) experienced abnormal negative returns. Also foreign banks that could be previously benefiting to some extent from their ability to perform universal banking through their foreign branches experienced abnormal negative returns. On top of this, large institutions seemed to have larger positive abnormal returns (or smaller negative ones). However, in principle, it is unclear that the GLBA benefits only larger companies. In fact by 2001 the firms that had achieved the status of Financial Holding Company (necessary to benefit from the act) concentrated on two different types of banks. First, the top tier bank holdings that were already trying to overcome the existing regulation and trying to be as "universal" as possible within the previous regulatory restrictions. Second, relatively small banks that were highly capitalized and healthy, but had no opportunity to expand within the previous regulation (Santomero, 2001).

Our second test period are the years between 1995-1999 versus 2000-2002.

An issue with using these deregulations as exogenous shocks to competition is the question of to what extent they were expected by the industry and therefore may have started to have an effect prior to the deregulation year. If the shareholders in the banking or financial services expected the deregulation then compensation contracts may have been changing prior to the deregulation date. Or in a more extreme case the fact that shareholders wanted to alter these compensation structures is what triggered the deregulation. Our analysis assumes that none of these stories hold. A way to assess to what extent they may be true is to estimate whether there were pre-existing trends in performance-pay sensitivities that were different for the deregulated and the non-deregulated sectors. We run regressions to evaluate this hypothesis and find that prior to the 1999 deregulation there were no significant differential trends in contract slopes between deregulated and non-deregulated sectors,

which lends credibility to the identifying assumption that the deregulation was an exogenous and sharp shock to product markets. The evidence for the 1994 deregullation is slightly more mixed with no clear trend prior to 1994 but some significant coefficients. Therefore the 1994 experiment seems to be ex-ante less clean than the 1999 one, and as we will see the results are less striking for that experiment.[3]

We now proceed to discuss the two specifications used to evaluate the effect of the deregulations on performance pay sensitivities.

### 3.2 Performance-pay sensitivities

In our first specification we posit a wage equation at the individual level to estimate the fixed component ($A_{ifjt}$) and the variable component of compensation ($B_{fjt}$(Performance$_{fjt}$), that is a function of a performance measure). Total compensation for executive $i$, in firm $f$, in sector $j$ in year $t$, can be written as $W_{ifjt} = A_{ifjt} + B_{fjt}(\text{Performance}_{fjt}) + u_{ifjt}$. The theoretical predictions outlined in the previous section imply that not only total pay will depend on a number of individual and firm characteristics, but the sensitivity of pay to performance itself will vary across firms and sectors with different features. We explicitly model the major determinants of these coefficients in our empirical analysis. These can be written as: $A_{ifjt} = f(\text{Competition}_{jt}, \text{individual}_{ifjt}, \text{firm characteristics}_{fjt})$ and $B_{fjt} = g(\text{Competition}_{jt})$. Assuming linear relationships[4]:

$$W_{ifjt} = A_{ifjt} + B_{fjt}Perf_{fjt} + u_{fijt} \tag{1}$$

$$\begin{aligned} A_{ifjt} &= a_0 + a_1 Competition_{jt} + \sum a_z Controls_{ifjt} \\ B_{fjt} &= b_0 + b_1 Competition_{jt} \end{aligned}$$

Given the compensation structure assumed, the estimation of the compensation equation should include terms where the performance measures interact with competition. The basic

[3] See tables in Appendix.

[4] Even though the compensation package of many executives may contain complex formulae, we are imposing linearity and implicitly estimating a simple compensation package that has a fixed element and a variable one related to the firm´s own profit. This is obviously a simplifying assumption, but our approach is sufficiently flexible to capture most of the effects that we are interested in while keeping the results interpretable. Moreover it seems that the non-discretionary component of executive compensation, usually follows simple formulas. And there are theoretical results on the linearity of incentives (Holmstrom and Milgrom, 1987).

estimated specification is:

$$\begin{aligned} W_{ifjt} &= a_0 + a_1 Competition_{jt} + \sum a_z Controls_{ifjt} + \\ &\quad + b_0 Perf_{fjt} + b_1 Competition_{jt} Perf_{fjt} + \eta_{if} + d_t + \epsilon_{ifjt} \end{aligned} \tag{2}$$

Where $Perf_{fjt}$ is performance, $Competition_{jt}$ is the relevant competition measure, $d_t$ are time dummies, $\eta_{if}$ are firm-specific individual effects (that change if an individual changes firm and therefore also capture the sector effects) and $\epsilon_{it}$ is a white noise. The main coefficient of interest is $b_1$ , i.e. how the performance pay sensitivity $B$ changes with the level of competition in the sector.

Given the measures of competition used exploit two deregulation episodes, the estimated equation can be rewritten as:

$$W_{ifjt} = a_0 + a_1 FIN_{jt} + b_0 Perf_{fjt} + b_1 FIN_{jt} Perf_{fjt} + \tag{3}$$

$$+ \sum a_z Controls_{ifjt} + \eta_{if} + d_t + \epsilon_{ifjt} \tag{4}$$

Where the deregulation indicator $FIN_{jt}$ takes value one for the treated sectors (banking for the 1994 deregulation or financial services for 1999) in the treatment period (post 1994 and post 1999 respectively). That is, it is an interaction between a treatment dummy $treat_j$ and a post deregulation dummy $post_t$.

The dependent variable $W_{ifjt}$ used in the analysis will be first the natural logarithm of different compensation measures. Our Total Compensation measure is defined as the sum of salary, bonus, total value of restricted stock granted, total value of stock options granted (using Black and Scholes), long term incentive payouts, and other annual payments. It includes the sensitivity arising from new restricted stock awards but not the change in incentives provided by the value of previous stock granted. We therefore also provide results for Total Compensation plus Restricted Stock Appreciation where the stock appreciation is computed as the value of the restricted stock portfolio in the previous year times the returns to shareholders in that year.We also show some results for cash compensation (salary and bonus).

The measure of firm performance is the log of shareholders value[5]. Note that the actual specification we estimate is in logs, where both the dependent variable and the performance

[5] Our performance measure is a stock measure, but given the fixed effects specification $b_i$ actually measures the change in pay associated to a change in shareholders value.

measure are in natural logarithms. This specification has the advantage of being less sensitive to outliers than one in levels and the estimated coefficients can be directly read off as elasticities[6].

The identification in this case comes from the fact that individuals in deregulated sectors had a change in the slope of their performance pay contracts ($b_1$) after the deregulation. Since we are introducing firm-specific individual fixed effects throughout the analysis the identification comes purely from a within-individual change in the competitive environment, while the individual stays in the same firm. Even though the variation in competition is at the sector level, if one omitted individual fixed effects, the fact that individuals with different permanent unobserved component of wages (say different ability levels, or risk aversion etc.) sort themselves into sectors with different degrees of competition can potentially bias the estimate of $b_1$. Note that in this way we also control for firm unobserved heterogeneity.

However the previous specification does not take into account that the sensitivity of pay to performance might have been different for deregulated and non-deregulated sectors throughout the sample period, or that it may have increased for all sectors after the deregulation[7]. If any of these is true, this would be captured in our estimate of $b_1$. To address this issue the following specification is estimated:

$$W_{ifjt} = a_0 + a_1 FIN_{jt} + b_0 Perf_{fjt} + b_1 FIN_{jt} Perf_{fjt} + \quad (5)$$

$$b_2 treat_j Perf_{fjt} + b_3 post_t Perf_{fjt} + \sum a_z Controls_{ifjt} + \eta_{if} + d_t + \epsilon_{it} \quad (6)$$

In this specification $b_2$ captures the fact that the deregulated sectors might have had different sensitivities throughout the sample period and $b_3$ captures whether after deregulation all sectors had a change in their contract sensitivities. This last specification provides a difference in differences estimator of the effect of competition on both the level and the slope of pay to performance. This estimator captures whether compensation contracts changed differentially before and after the deregulation for individuals in the different sectors (the deregulated or treated sector and the control sector). It takes into account (it differences out) the fact that the two groups may have had different contracts throughout the sample period and the fact that after the deregulation all sectors may have had a change in

[6] It is also similar to the specifications in Bertrand and Mullainathan (2001), Rosen (1992) amd Murphy (1986) among others.

[7] This was roughly the specification estimated by Hubbard and Palia (1995) that computed difference in differences estimators only on the levels. We also provide difference in differences estimates on the slope.

compensation structures.

In addition to the basic specifications with the natural experiments a number of robustness checks are performed.

The first check is to restrict the sample to CEOs instead of looking at all the executives in the sample.

The second check is to introduce explicitly a measure of rents in the analysis because in addition to the pure competition effects one may expect that rent extraction activities affect the compensation package offered to executives. Given the available data this is defined as a markup measure computed as profits before interest, taxes and extraordinary items over sales[8]. In principle higher rents should increase the fixed component of compensation and leave the variable part unaffected. That is the way in which risk averse managers can obtain the highest utility for a given amount of rent extraction. However, if they intend to camouflage this rent extraction as a provision of incentives they may decide to extract rents also in the variable part of the compensation package. This effect goes in the same direction as the one predicted by the implicit incentives of the risk of the firm going bankrupt, i.e. it would tend to reduce the sensitivity of pay to performance as competition increases (rents fall). A priori we expect that the sensitivity decreases with competition, so if anything omitting rents would reduce that coefficient. It must be noted though that the risk of using the rents measure is that it may be endogenous if we think that the level of managerial pay affects rents. As we will see, introducing rents has a very small effect on the coefficient of interest indicating that it is to a large extent orthogonal to our problem and hence leaving it out does not have any major implications.

The third check is to allow for the possibility of Relative Performance Evaluation (RPE). To that end we introduce as a control the average stock market returns in the sector and also interact it with the deregulation variables. If firms use RPE to set compensation contracts then the sector returns coefficient should enter the regression with a negative sign, and its difference with the estimated sensitivity (the coefficient on the performance variable) is the RPE estimate. We also assess how RPE changed following the deregulation.

### 3.3 Stock option grants sensitivities

In the specifications of the previous section, the sensitivity of executive pay to firm performance is estimated by including a pay measure on the left hand side of the equation and

[8] Because of data limitations we cannot deduce the true cost of capital.

a performance measure (shareholders wealth) on the right hand side of the equation. The effect of the experiments is estimated by interacting dummy variables for the treated firms in the relevant periods with the performance measure and including the relevant variables to control for general time trends and composition differences. However, an alternative measure of the sensitivity of executive compensation to changes in shareholders wealth can be explicitly calculated using a formula and not an econometric estimation: this is the sensitivity of the stock option packages granted.

The delta of each option measures the sensitivity of the value of that option to changes in share price. We can use this information to calculate the sensitivity of a particular stock option grant to changes in shareholders value. Given that stock option grants have become one of the main sources of contingent remuneration for executives these are very relevant measures to see the evolution of performance-related-pay with competition.

We measure the sensitivity of the value of the option packages granted to the executive to changes in the value of the firm, using the measure introduced by Yermack (1995). It consists in multiplying the sensitivity of the price of each option to the share price (delta) by the percentage of total shares outstanding that the new issue of options represents, i.e. the sensitivity of executive pay to changes in shareholders wealth associates to each option issue is measured as $\Delta \cdot \frac{\text{Number of shares represented by option award}}{\text{Number of shares outstanding}}$.[9] Then we add the sensitivity of the different issues of a particular period to get the total sensitivity measure for that year. The measure is expressed in extra dollars of compensation for every 1000 extra dollars of shareholders wealth.

In the data, the total amount of grants is 82,912 and the weighted average delta of all grants is 0.77. The total amount of year-executive observations that have at least one grant is 19,731 and the median sensitivity across individuals of all the granted packages is 37.6 cents per 1000 extra dollars of shareholders value.

To identify whether the change in competition in our experiments altered the sensitivity of the packages of options granted we run the following regression:

[9] We use exactly the same methodology used in Yermack (1995). The sensitivity $\Delta$ is defined as $\frac{\partial \text{ Black Scholes Value}}{\partial \text{ Share price}}$. The derivative of the black scholes value is calculated using the monthly volatility of the stock price over the last 60 months, the average dividend yield of the stock, and the risk free interest rate. The maturity of new option grants with missing information about their time to maturity is set to 10 years, as this is the most frequent maturity (Hall and Liebman 1998). The summary statistics of the delta measure are comparable with the ones obtained by Hartzell and Starks (2002) in a similar sample of Execucomp.

$$Option\ Grant\ Sensitivity_{ifjt} = \alpha + \beta FIN_{jt} + d_t + d_j + \eta_i + \varepsilon_{ifjt}$$

This is a standard difference in differences estimation in which $\beta$ measures the differential change in sensitivity of the sectors subject to a deregulation with respect to the sectors that were not deregulated. The presence of year and sector dummies guarantees that we are not just capturing a general change after the deregulations or a compositional effect. Note that given that the measure is a pay-performance sensitivity in itself, we need not interact the deregulation dummy with the performance measure.

Given that we want to measure the change in the compensation policy of the firm after the deregulation, most of the relevant information relative to options is contained in the new option grants. If firms want to increase (decrease) the sensitivity of pay to performance of their executives they can increase (decrease) the amount of options granted and also use options with higher (lower) delta. However, ideally one would also want to measure the overall sensitivity of the stock option holdings. This measure cannot be calculated with the data available in Execucomp[10].

### 3.4 Governance and the competitive environment

The previous structure is designed to assess the effect of the deregulation on the sensitivity of pay to performance. On a related matter, previous research has found that the degree of governance of firms has an effect on the sensitivity of performance contracts. The question in this setting is therefore whether the degree of competition has a differential effect in sectors with high versus low governance and how low governance firms react.

A priori one expects two possible effects. On the one hand it is possible that high governance firms are better at adapting optimally to the change in competition, and therefore the adjustment in sensitivities is larger for those firms. On the other hand if the increase in competition implies an increase in the transparency of the market (as Hart, 1982 and Scharfstein, 1988 assume in their models), then one would expect that the increase in competition reduces the gap between high and low governance firms, that their behavior is brought closer. In this case the increase of competition in some way reduces agency problems and we expect that the effect of competition should be larger in low governance firms,

[10] See Hall and Liebman (1998) for an attempt to measure the overall option portfolio sensitivity. This calculation requires a large amount of data periods and relies on a set of assumptions to compensate for the lack of information on some aspects like which options are executed first.

so that the difference in pay structures is reduced.

We address this issue directly by estimating how low governance firms alter the structure of contracts relative to high governance firms. We measure good governance by the presence of an institutional investor controlling more than 5% of total equity. This was constructed by merging the information in the Thomson Financial 13-f database to the Execucomp dataset. Thomson provides the information on large shareholders from the institutional investors 13-f filings. Investors with more than $100 million in equities must report their equity holdings to the SEC. We define as high governance firms those who have at least one institutional investor controlling more than 5% of total equity. These represent around half of the sample, so the high and low governance groups are fairly evenly defined.

Hartzell and Starks (2003) show that the presence of large institutional investors has a impact on executive compensation in that it lowers the level of compensation but increases pay-performance sensitivities indicating that there is some sort of increased monitoring and hence improved governance in those firms.

# 4 Results

The next three sections present the results of our estimations. Section 4.1 shows the results regarding the effects of the experiments on the total pay of executives. Section 4.2 concentrates on how the sensitivity of the stock option packages granted to executives changed after the deregulation experiences and finally Section 4.3 explores the possible interaction between corporate governance and competition when determining the compensation packages.

Notice that to avoid the interference between both natural experiments we use the period 1992-1994 as the control sample for the first experiment (banking sector, SIC 60) and 1995-1998 as the treatment period. The treated sector is the banking sector (SIC code at two digits is 60) and the comparison group is the rest of the financial services sector(SIC 60 to 69). For the second experiment (financial services sector, SIC 60 to 69) we will use 1995-1999 as the control sample and 1999-2002 as the treatment period. The treatment group here is made by firms in sectors with SIC codes 60 to 64 and 67 and the control group are the other sectors in the economy.

### 4.1 Competition and performance-pay sensitivities

Table 2 shows the results associated with the 1999 deregulation experiment. The first three columns correspond to a differences estimator that measures the change in performance-pay sensitivity of the deregulated sectors post deregulation. Column three corresponds to the total compensation awarded to the executive. This dependent variable includes all the cash compensation plus the new grants of options and restricted stock. The coefficient associated with the variable "Performance" shows the baseline elasticity of performance-pay sensitivity for sectors that were not deregulated and also for the deregulated sectors prior to the deregulation. For example, column three shows that an increase in shareholders wealth of 10% increases executive compensation by 2.65%. The coefficient of interest is associated with the variable "FIN99*Performance". It shows the change in slope that deregulated sectors experienced with respect to themselves and other sectors. The results show a positive and statistically significant coefficient that represents an increase in performance-related-pay of 0.27% extra pay for a 10% increase in shareholders value. With respect to the baseline sensitivity this represents a relative increase of 10.1%. Columns one and two show the same specification but using two alternative measures of pay. Column one uses a more restrictive measure that contains only salary plus bonus and column three uses a more comprehensive measure of pay that contains also the appreciation of pre-existing packages of restricted stocks. The results with the more comprehensive measure of pay, show a positive but not significant effect. The results in column one show a decrease in the sensitivity of salary and bonus to the results of the firm. This seems a bit surprising when compared with the general results of this paper, although we will see in the next specification that this result may be largely due to a general decrease in the performance-pay sensitivity of this component in the last years.

As mentioned, the identification strategy of the first three columns relies on a differences estimator. The results could be biased, either because there is a time trend in performance-pay or differences between deregulated and not-deregulated sectors that remain constant throughout the different periods but are captured by the differences estimator. To address this issue we present in columns four to six of Table 2 a difference in differences estimator that contains two additional variables. The first variable is the interaction of the *post* 1999 dummy variable with shareholders wealth to control for any global change in performance-pay sensitivities. The second variable "Treated99*Performance" is the interaction of a dummy that takes value one for the deregulated sector throughout the whole sample with

shareholders wealth and it controls for any pre-existing differences between deregulated and non deregulated sectors in terms of performance-pay sensitivities. This is therefore our preferred specification.

The specification in column six includes the total compensation awarded to the executive. The baseline sensitivity shows an increase of 2.59% in pay associated with a 10% increase in shareholders wealth. The coefficient associated with the deregulation experience shows a relative increase in performance-pay sensitivity of 0.37% for every 10% of increased shareholders wealth. So relative to the baseline sensitivity of 2.59%, deregulation lead to an increase in the sensitivity of executive pay to increases in shareholders wealth of 14% more with respect to the change in sensitivity experienced by non deregulated sectors. The result is robust to a more comprehensive measure of pay like the one in column five, but becomes statistically insignificant once we concentrate on salary and bonus only. There are two other interesting results in this set of regressions. First, the coefficient associated with the variable Post99*Performance is negative and statistically significant. This is due to the fact that the sensitivity of performance-related-pay fell from 2000. The coefficient associated to the experiment is slightly larger so a more accurate interpretation of the results is that while the performance-pay sensitivity of the rest of the sectors went down after year 2000 the deregulated sectors maintained their previous sensitivity and even increased it slightly. Second, the coefficient associated with the variable FIN99 is negative and statistically significant, indicating a reduction in the fixed component of pay. Overall we can conclude that the 1999 deregulation lead to executive pay packages that had a lower fixed component and a larger performance based component relative to the sectors that were not deregulated. These results are consistent with the predictions of Raith (2003); or in the spirit of Schmidt (1997) one should say that the effect associated with the additional elasticity of returns to managerial effort dominates the implicit discipline imposed by higher competition.

Table 3 shows the same specifications as Table 2 but associated with the 1994 deregulation experiment. The baseline sensitivity in column three is 3.31% for a 10% increase in shareholders wealth. The experiment shows a positive and significant result of 0.36% extra sensitivity after the deregulation. It is also interesting to see that the result on the variable FIN94 is negative and statistically significant, showing a relative decrease in the fixed component of pay after the deregulation.

Again one could be worried about the possibility that we could be capturing either a compositional effect or a time trend so we perform a difference in differences estimator on

the slope in columns four to six. The difference in differences estimator is only statistically significant in the regression that includes as pay variable only salary and bonus, and in fact, in our preferred specification, (the one in column six) the effect is not statistically significant. The coefficient of the variable "Post94*Performance" helps to interpret the results. We know from columns one to three that performance related pay increased for deregulated sectors after 1994. However the coefficient on "Post94*performance" indicates that the overall trend for the whole financial sector after 1994 was to increase the sensitivity of pay to performance except for the most restrictive measure of pay that only includes salary and bonus. Therefore, while we can unambiguously say that competition increased the sensitivity of the salary plus bonus component for deregulated sectors, it is unclear if the effect on overall pay came from deregulation or just from the trend of the financial sector as a whole; the coefficient of the variable "Post94*performance" that measures that incremental effect remains positive but it is statistically not significant.

Overall, the results of the basic specifications associated with the 1994 experiment point in the same direction as the 1999 deregulation. That is deregulation lead to remuneration packages that were more sensitive to performance and had a lower fixed component. However, as seen the results are less robust to a difference in differences specification.

Tables 4 and 5 present several robustness checks. Table 4 corresponds to the 1999 specification while Table 5 corresponds to the 1994 deregulation. The dependent variable is log of total compensation and all the specifications are difference in differences estimators (in the same way as column six of Tables 2 and 3). Column one of each table restricts the analysis to CEO's only. While the effect of the experiment is still positive on the slope, the results are not statistically significant once we restrict ourselves to CEO's alone.

Column two includes a markup variable ("rents") that measures earnings before interest and taxes over sales and its interaction with shareholders wealth. This measure is likely to capture the markup that firms are able to charge that is inherently related to the competitive environment. The reason to include this robustness check is that competition might alter the rents that the firm has. The effect of the competitive shock could be therefore due to its impact on the intensity of rent extraction of the executives of the firm, so we would like to know if the effect that we are capturing is a direct impact of competition or an indirect impact of competition through the rents of the firm. The results regarding the 1999 experiment show that the effect of the deregulation is still statistically significant and sizeable even in the presence of these controls. The control variables do not show statisti-

cally significant results which suggests that the effect of the deregulation was not due to a change in rent-extraction. The results regarding the 1994 experiment remain statistically insignificant. With respect to the control variable, the coefficient is negative and significant in the regression of the 1994 experiment and the coefficient on "Rents*Performance" is positive and statistically significant, indicating that the level of executive pay is negatively related to the markup that firms are able to obtain while the slope of the contracts is positively related. One possible interpretation of these results in the spirit of the managerial power literature would be that deregulation imposed higher constraints on the rent extraction activities of executives, so they had to shift from extraction in the fixed part of pay to extraction on the variable part due to camouflage reasons. However identifying this effect would clearly require further work and it is not the main objective of this paper.

Column three of Tables 4 and 5 includes as control variables the average shareholders wealth of the sector where the firm belongs at two digits SIC and their interaction with the deregulation dummy variable. This allows for the presence of Relative Performance Evaluation in compensation (RPE). If compensation packages contain relative performance evaluation measures we may have been capturing the change in this part of pay as a change in the sensitivity of own performance. Aggarwal and Samwick (1999) argue that principals used RPE to induce a given type of competitive behavior. Here the channel exploited goes from exogenous changes in competition in a given sector to performance contracts, hence that type of mechanism is unlikely to be present. In fact the inclusion of these extra variables does not change the results. We find that in both cases there is RPE (the coefficient on Sector Performance is negative and significant), but that this does not change the effect of competition: the coefficients on Sector*Perf.*FIN99 and Sector*Perf.*FIN94 are not statistically significant, indicating no change in relative performance evaluation following the deregulations. The effect of competition on performance-pay sensitivities clearly survives in the 1999 experiment while it is still statistically insignificant in the 1994 one.

### 4.2 Competition and stock option grants sensitivity

The sensitivity of pay to performance can also be assessed through the sensitivity of stock option grants. The advantage of this measure is that it is directly computed and not estimated from the data. Even though stock option grants are only a part of the compensation package, it is the part that is most sensitive in value to shareholders wealth and also the

component of compensation that has been growing most in the last two decades. As a whole, option grants represent a very significant part of total compensation and an even higher share of the contingent part of it. This section emphasizes the dual role of stock options in executive compensation. In the previous section (and in most of the existing literature) options are evaluated at their value at inception and treated as a cash reward. This approach is simple and probably correct if executives have a portfolio of the firm stocks and stock options that they can rebalance to keep constant their exposure to changes in the share price. However if this rebalancing is not feasible, options are in themselves an instrument to provide incentives, and one should consider them as a long term contingent payment in the spirit of this section.

Table 6 shows how this sensitivity changed following the two deregulations. Columns one to three correspond to the 1999 experiment and columns four to six to the 1994 experiment. All the regressions correspond to a difference in differences estimation.

Column one corresponds to a specification without individual time trends. The effect of the experiment has a positive coefficient but it is not statistically significant at the 10% level. The second column corresponds to a specification including sector specific time trends. This specification controls for any linear trend in the sensitivity of the stock option packages awarded to executives. The result shows a positive and significant coefficient that represents roughly an increase of 40 cents of extra pay per 1000 dollars of shareholders value.

The results corresponding to the 1994 experiment are quite similar. The specification without sector time trends yields a positive and statistically significant coefficient of about 20 cents of extra pay for every 1000 extra dollars of shareholders wealth. The inclusion of sector specific time trends emphasizes again the effect, showing a positive and significant coefficient, with an increase in sensitivity of 50 cents of pay per 1000 dollars of extra shareholders wealth.

The overall results of this section show that the effect of the 1999 deregulation increased the sensitivity of option grants confirming the results of the previous sections. We also find a higher sensitivity of the option packages granted associated with the 1994 deregulatory experience that had less robust results in the previous sections.

### 4.3 Governance

Finally we assess whether the impact of product market competition was different under different governance structures. In particular we analyze the effect of the presence of large

institutional investors. This is a way of assessing whether the mechanism driving the increase in performance pay sensitivities following the deregulations results from the induced change in the profit distribution or rather from a change in the degree of agency problems.

The presence of large institutional investors has been shown to be related to a higher control of what executives do and hence to better governance (Hartzell and Starks, 2003). Taking as our measure for improved governance the presence of at least one institutional investor that controls more than 5% of total equity, we assess whether the deregulations had different effects across firms with different governance levels. To avoid the fact that institutional investors may react to the deregulation and alter their portfolio, we use the fact that they controlled more than 5% of total equity on the year prior to the deregulation. This dummy variable is held constant throughout the period of analysis to avoid the potential endogeneity of ownership levels.

Table 7 shows the effect of both deregulations on the structure of bonus and total compensation for different governance structures. The coefficient on the interaction between governance and the performance measure captures whether firms with better governance according to our measure had different sensitivities of pay to performance (the effect of governance on the level of pay is absorbed by the firm specific individual fixed effect). In the 1999 experiment, there are no significant differences in behavior between the two groups. When this variable is interacted with the experiment variable (FIN99) it reflects the differential effect of the experiment across governance structures. Again, for 1999 no significant differences emerge.

In the 1994 experiment and sample, high governance firms show significantly higher sensitivities (which is consistent with the results in Hartzell and Starks, 2003), however in this case again there does not seem to be a significant difference on the effect of the experiment for the two groups.

Our interpretation of the results is that the deregulation did not have a significant differential effect across levels of governance and therefore that the mechanism driving the results on the affect of competition seems to rely more on the change in the structure of profits following the deregulation (that affected all firms) rather than on an agency story.

# 5 Conclusions

The determinants of managerial compensation have received a lot of attention and faced heated debate but little is known about how these are affected by the degree of product mar-

ket competition that firms face. The competitive environment generates implicit incentives that determine the design of compensation packages and hence alter the need for and magnitude of explicit incentives. In this paper we draw together the main theories explaining managerial compensation and the impact of product market competition on compensation packages and evaluate empirically its effect.

Our results indicate that the net effect of product market competition is to increase the performance pay sensitivity, implying that as competition increases managers will be faced with steeper contractual incentives. In particular we use two deregulation experiences as quasi-natural experiments for exogenous increases in competition levels for a subsample of firms. The results are robust to a number of specification checks including controls for the availability of rents and rent extraction and for the implicit risk in the economic environment faced by the manager. They are also confirmed both when we compute the sensitivity of total compensation to firm performance explicitly, as well as when we use the sensitivity of stock option grants.

The results therefore indicate that increased product market competition leads to a higher reliance on performance related pay. Thus it provides a potential explanation for the trend over the past decades of an increased use of these compensation mechanisms. It also indicates that there may be an impact of competition on the dispersion of earnings in the economy if, as product markets become more competitive, performance-related pay contracts become more pervasive for all levels of workers. Direct tests of these issues are left for future research.

## References


[1] Aggarwal, Rajesh K.; Andrew A. Samwick; (1999) Executive Compensation, Strategic Competition, and Relative Performance Evaluation: Theory and Evidence; *Journal of Finance*, December, v. 54, iss. 6, 1999-2043

[2] Bebchuk,Lucian Arye, Jesse M. Fried; David I. Walker; (2002) Managerial Power and Rent Extraction in the Design of Executive Compensation, Harvard Law School DP 366

[3] Bertrand, Marianne; Sendhil Mullainathan; (2001) Are CEOs Rewarded for Luck? The Ones Without Principals Are, *The Quarterly Journal of Economics*, 116(3), August 901-32

[4] Calomiris, Charles W.; (2002) Banking Approaches the Modern Era *Regulation* Summer, 25, 2.

[5] Carow, Kenneth A.; Randall A. Heron; (2002) Capital Market Reactions to the Passage of the Financial Services Modernization Act of 1999. *The Quarterly Review of Economics and Finance* 42: 465-485

[6] Crawford, Anthony J.; John R. Ezell; James A. Miles; (1995) Bank CEO Pay-Performance Relations and the Effects of Deregulation *The Journal of Business* Vol 68 No. 2 (April) 231-256

[7] De Young, Robert; Iftekhar Hasan; Bruce Kirchoff; (1998) The Impact of Out-of-State Entry on the Cost Efficiency of Local Commercial Banks *Journal of Economics and Business* 50: 191-203

[8] Hall, Brian J.; Jeffrey B. Liebman (1998) Are CEOs Really Paid Like Bureaucrats? *Quarterly Journal of Economics*, 653-691.

[9] Hart, Oliver (1983) The Market Mechanism as an Incentive Scheme, *Bell Journal of Economics* 74 , 366-682

[10] Hartzell, Jay C.; Laura T. Starks; (2003) Institutional Investors and Executive Compensation mimeo *AFA 2003 Washington, DC Meetings.*

[11] Hermalin, Benjamin E. (1992) The Effects of Competition on Executive Behaviour *The RAND Journal of Economics,* Vol.23 No.3 Autumn, 350-365

[12] Holmstrom, Bengt (1979) Moral Hazard and Observability *The Bell Journal of Economics*, Vol. 10, No. 1. Spring , 74-91.

[13] Holmstrom, Bengt; Paul Milgrom ; (1987) Aggregation and Linearity in the Provision of Intertemporal Incentives; *Econometrica*, March, v. 55, iss. 2, 303-28

[14] Hubbard, Glenn R.; Darius Palia; (1995) Executive pay and performance Evidence from the US banking industry, *Journal of Financial Economics* 38 105-130

[15] Jayaratne, Jith; Philip E. Strahan; (1996) The Finance-Growth Nexus: Evidence from Bank Branch Deregulation. *Quarterly Journal of Economics* 111, 639-670.

[16] Jayaratne, Jith; Philip E. Strahan; (1998) Entry Restrictions, Industry Evolution, and Dynamic Efficiency: Evidence from Commercial Banking. *The Journal of Law and Economics* 41, 239-273.

[17] Joh, Sung Wook; (1999) Strategic Managerial Incentive Compensation in Japan: Relative Performance Evaluation and Product Market Collusion, *Review of Economics and Statistics*, May; 81(2): 303-13

[18] Joskow, Paul L.; Nancy Rose; Andrea Shepard; John R. Meyer; Sam Peltzman; (1993) Regulatory Constraints on CEO Compensation *Brookings Papers on Economic Activity. Microeconomics,* Vol. 1993, No. 1. pp. 1-72

[19] Joskow Paul L.; Nancy L. Rose; Catherine D. Wolfram; (1996) Political Constraints on Executive Compensation: Evidence from the Electric Utility Industry *The RAND Journal of Economics,* Vol. 27, No. 1. Spring, pp. 165-182

[20] Kedia, Simi (2003), Product Market Competition and Top Management Compensation, Harvard University Working Paper Series, Finance Unit.

[21] Mirrlees, James A.; (1976) The Optimal Structure of Incentives and Authority within an Organization *The Bell Journal of Economics*, Vol. 7, No. 1. Spring, 105-131.

[22] Mirrlees, James A. (1974) Notes on Welfare Economics, Information and Uncertainty In M. S. Balch, D. L. Mc Fadden and S. Y. Wu Eds. *Contributions to Economic Analysis*, Oxford North Holland

[23] Murphy, Kevin J.; (1986) Incentives, Learning, and Compensation: A Theoretical and Empirical Investigation of Managerial Labor Markets, *Rand Journal of Economics*, 17(1), Spring, 59-76.

[24] Murphy, Kevin J Executive Compensation; (1999) Handbook of labor economics. Volume 3B„ 2485-2563, Handbooks in Economics, vol. 5. Amsterdam; New York and Oxford: Elsevier Science, North-Holland

[25] Nichols, Mark W.; Jill Hendrickson; (1997) Profit Differential Between Canadian and U.S. Commercial Banks: The Role of Regulation *Journal of Economic History*, September, 674-96.

[26] Raith, Michael , Competition, Risk and Managerial Incentives, (2003) *American Economic Review,* September

[27] Rosen, Sherwin, (1992), Contracts and the Market for Executives, in Lars Werin and Hans Wijkander (eds), *Contract Economics*, Oxford: Blackwell, chapter 7, 181-211.

[28] Santomero; Antony M. (2001) The Causes and Effects of Financial Modernization *Business Review Federal Reserve Bank of Philadelphia* Q04

[29] Scharfstein, David; (1988) Product-Market Competition and Managaerial Slack *The RAND Journal of Economics*, Vol.19 No.1 Spring, 147-155

[30] Schmidt, Klaus M.; (1997) Managerial Incentives and Product Market Competition; *Review of Economic Studies*, April , v. 64, iss. 2, 191-213

[31] Shapiro, Carl; Stiglitz, Joseph E.; (1984) Equilibrium Unemployment as a Worker Discipline Device. *American Economic Review*, June, v. 74, iss. 3, 433-44

[32] Stiroh, Kevin J and Philip E Strahan. (2003) Competitive dynamics of deregulation: Evidence from U.S. banking *Journal of Money, Credit, and Banking.* Oct 2003. Vol. 35, Iss. 5; pp. 801

[33] Yermack, David (1995), Do corporations award CEO stock options effectively? *Journal of Financial Economics* 39, 237-269.

# 6 Tables

Table 1: Descriptive Statistics

a. Sample period is 1995-2002 for 1999 sample and 1993-1999 for 1994 sample. Sectors included in 1999 experiment: all the services, the deregulated sector being the financial services (SIC 60 to 67). Sectors included in the 1994 experiment are only the financial services, the deregulated sector being Banking (SIC60).

b.All nominal variables in 1996 US dollars.

c. Total Compensation equals the sum of salary, bonus, total value of restricted stock granted, total value of stock options granted (using Black and Scholes), long term incentive payouts, and other annual payments. To this we add the actual appreciation on the restricted stock from year to year to compute Total Comp.+Restr Stock.

d. Stock option grant sensitivity computed as in Yermack (1995).

e. Rents are defined as profits before interest, taxes and extraordinary items over sales. New executives dummy is defined as executives that move into a deregulated firm after the deregulation from outside the firm.

| | 1999 Experiment sample | | 1994 Experiment sample | |
|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. |
| Salary plus bonus (1,000 US dollars) | 751 | 1,421 | 828 | 1673 |
| ln(Salary plusBonus) (US dollars) | 13.02 | 0.973 | 13.16 | 0.97 |
| Total comp. (1,000 US dollars) | 28,188 | 9,237 | 2049 | 5446 |
| ln(Total comp.) ( US dollars) | 13.95 | 1.22 | 13.8 | 1.07 |
| Total comp.+Restr Stock appreciation (1,000 US dollars) | 3543 | 11938 | 2904 | 8106 |
| ln(Total comp.+Restr Stock appreciation) (US dollars) | 14.14 | 1.257 | 14.07 | 1.125 |
| Performance: Shareholder value (1,000,000 US dollars) | 7113 | 26206 | 4689 | 9185 |
| ln(shareholder value) (1,000,000 US dollars) | 7.37 | 1.61 | 14.1 | 1.12 |
| Stock option grants sensitivity | 0.0012 | 0.0032 | 0.00057 | 0.0022 |
| Rents (markup) | -0.217 | 6.99 | 0.248 | 5.33 |
| Average sector ln(shareholder wealth) | 7.37 | 0.638 | 7.464 | 0.501 |
| New executives, percentage | 0.024 | | 0.118 | |
| Governance: Instit. Investor contols 5% equity, percentage | 0.138 | | 0.443 | |
| CEO, percentage | 0.143 | | 0.12 | |

Table 2: Financial Services Deregulation 1999: Effect on Performance-Pay Sensitivities

Performance is measured as the log of shareholder wealth.

FIN99 takes value 1 if the individual is in the financial services sector after 1999, 0 otherwise. Treated99 takes value 1 for executives in the financial services sector, 0 otherwise.

See Notes to Table 1 for a definition of all other variables and exact samples.

All regressions contain a CEO dummy as well as firm specific individual effects, therefore account for sector, firm and individual permanent unobserved heterogeneity.

| | ln(Sal.+Bon.) | ln(Total+Restr.) | ln(Total Comp.) | ln(Sal.+Bon.) | ln(Total+Restr.) | ln(Total Comp.) |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Performance | 0.1242*** | 0.3277*** | 0.2654*** | 0.1239*** | 0.3328*** | 0.2592*** |
| | [0.0076] | [0.0149] | [0.0114] | [0.0095] | [0.0195] | [0.0146] |
| FIN99*Performance | -0.0154* | 0.012 | 0.0276** | -0.0012 | 0.0460** | 0.0375** |
| | [0.0086] | [0.0153] | [0.0126] | [0.0121] | [0.0221] | [0.0180] |
| FIN99 | 0.0706 | -0.0078 | -0.2546** | -0.0325 | -0.2545 | -0.3287** |
| | [0.0712] | [0.1284] | [0.1044] | [0.0933] | [0.1706] | [0.1378] |
| Treated99*Performance | | | | 0.0256 | 0.0434 | 0.0450* |
| | | | | [0.0163] | [0.0321] | [0.0245] |
| Post99*Performance | | | | -0.0196** | -0.0433*** | -0.0178 |
| | | | | [0.0083] | [0.0155] | [0.0126] |
| Year dummies | yes | yes | yes | yes | yes | yes |
| Sector dummies | yes | yes | yes | yes | yes | yes |
| Individual effects | yes | yes | yes | yes | yes | yes |
| Observations | 20645 | 12403 | 17680 | 20645 | 12403 | 17680 |

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Banking Sector Deregulation 1994: Effect on Performance-Pay Sensitivities

Performance is measured as the log of shareholder wealth.

FIN94 takes value 1 if the individual is in the Banking sector after 1994, 0 otherwise. Treated94 takes value 1 for executives in the Banking sector, 0 otherwise.

See Notes to Table 1 for a definition of all other variables and exact samples

All regressions contain a CEO dummy as well as firm specific individual effects, therefore account for sector, firm and individual permanent unobserved heterogeneity.

| | ln(Sal.+Bon.) | ln(Total+Restr.) | ln(Total Comp.) | ln(Sal.+Bon.) | ln(Total+Restr.) | ln(Total Comp.) |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Performance | 0.1113*** | 0.4741*** | 0.3310*** | 0.1238*** | 0.4513*** | 0.3262*** |
| | [0.0151] | [0.0316] | [0.0204] | [0.0195] | [0.0397] | [0.0264] |
| FIN94*Performance | 0.0333*** | 0.0437** | 0.0365** | 0.0448*** | 0.0039 | 0.0241 |
| | [0.0117] | [0.0192] | [0.0147] | [0.0166] | [0.0279] | [0.0210] |
| FIN94 | -0.3364*** | -0.3065* | -0.2935** | -0.4087*** | 0.0574 | -0.1797 |
| | [0.0966] | [0.1580] | [0.1210] | [0.1239] | [0.2072] | [0.1565] |
| Treated94*Performance | | | | -0.0251 | -0.0894* | -0.0277 |
| | | | | [0.0284] | [0.0530] | [0.0369] |
| Post94*Performance | | | | -0.0082 | 0.0725*** | 0.0215 |
| | | | | [0.0106] | [0.0179] | [0.0136] |
| Year dummies | yes | yes | yes | yes | yes | yes |
| Sector dummies | yes | yes | yes | yes | yes | yes |
| Individual effects | yes | yes | yes | yes | yes | yes |
| Observations | 9430 | 5239 | 8008 | 9430 | 5239 | 8008 |

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 4: Financial Services Deregulation 1999: Robustness checks

Performance is measured as the log of shareholder wealth.

FIN99 takes value 1 if the individual is in the financial services sector after 1999, 0 otherwise. Treated99 takes value 1 for executives in the financial services sector, 0 otherwise.

See Notes to Table 1 for a definition of all other variables and exact samples

All regressions contain a CEO dummy as well as firm specific individual effects, therefore account for sector, firm and individual permanent unobserved heterogeneity.

Column one restricts the sample to CEOs. Column two introduces rents explicitly, and accounts for the possibility of rent extraction. Column three introduces sector returns to account for the possibility of Relative Performance Evaluation in incentive contracts. Column four assesses what part of the effect comes from contracts signed with new executives as opposed to existing ones.

| | CEOs | Control for Rents | RPE |
|---|---|---|---|
| | 1 | 2 | 3 |
| Performance | 0.3861*** | 0.2663*** | 0.2707*** |
| | [0.0443] | [0.0148] | [0.0154] |
| FIN99*Performance | 0.0054 | 0.0330* | 0.0362* |
| | [0.0523] | [0.0184] | [0.0188] |
| FIN99 | -0.0282 | -0.2929** | -0.5032 |
| | [0.4074] | [0.1407] | [0.4651] |
| Treated99*Performance | 0.1002 | 0.0408* | 0.0314 |
| | [0.0770] | [0.0247] | [0.0266] |
| Post99*Performance | -0.0458 | -0.0084 | -0.0208 |
| | [0.0358] | [0.0128] | [0.0130] |
| Rents | | -0.005 | |
| | | [0.0051] | |
| Rents*Performance | | 0.0013 | |
| | | [0.0008] | |
| Sector Performance | | | -0.0960** |
| | | | [0.0388] |
| FIN99*Sector Performance | | | 0.0184 |
| | | | [0.0644] |
| Treated99*Sect.Perf. | | | 0.0912* |
| | | | [0.0552] |
| Post99*Sect.Perf. | | | 0.034 |
| | | | [0.0534] |
| Year dummies | yes | yes | yes |
| Sector dummies | yes | yes | yes |
| Individual effects | yes | yes | yes |
| Observations | 3226 | 19058 | 19122 |

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 5: Banking Sector Deregulation 1994: Robustness checks

Performance is measured as the log of shareholder wealth.

FIN94 takes value 1 if the individual is in the Banking sector after 1994, 0 otherwise. Treated94 takes value 1 for executives in the Banking sector, 0 otherwise.

See Notes to Table 1 for a definition of all other variables and exact samples

All regressions contain a CEO dummy as well as firm specific individual effects, therefore account for sector, firm and individual permanent unobserved heterogeneity.

Column one restricts the sample to CEOs. Column two introduces rents explicitly, and accounts for the possibility of rent extraction. Column three introduces sector returns to account for the possibility of Relative Performance Evaluation in incentive contracts. Column four assesses what part of the effect comes from contracts signed with new executives as opposed to existing ones.

| | CEOs | Rents | RPE |
|---|---|---|---|
| | 1 | 2 | 3 |
| Performance | 0.4824*** | 0.3452*** | 0.3251*** |
| | [0.0718] | [0.0269] | [0.0276] |
| FIN94*Performance | -0.0719 | 0.0211 | 0.033 |
| | [0.0498] | [0.0211] | [0.0216] |
| FIN94 | 0.5447 | -0.1529 | 1.2568 |
| | [0.3785] | [0.1577] | [2.2150] |
| Treated94*Performance | 0.0094 | -0.0395 | 0.0651 |
| | [0.0964] | [0.0371] | [0.0473] |
| Post94*Performance | 0.0383 | 0.0247* | 0.0199 |
| | [0.0294] | [0.0137] | [0.0144] |
| Rents | | -0.2461*** | |
| | | [0.0705] | |
| Rents*Performance | | 0.0408*** | |
| | | [0.0118] | |
| Sector Performance | | | -0.3729*** |
| | | | [0.0903] |
| FIN94*Sector Performance | | | -0.1975 |
| | | | [0.3076] |
| Treated94*Sect.Perf. | | | -0.0691 |
| | | | [0.3032] |
| Post94*Sect.Perf. | | | 0.0893* |
| | | | [0.0506] |
| Year dummies | yes | yes | yes |
| Sector dummies | yes | yes | yes |
| Individual effects | yes | yes | yes |
| Observations | 1251 | 8249 | 8279 |

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 6: Option grant sensitivities

Columns 1 and 2 (3 and 4) correspond to the 1999 (1994) experiment.

FIN99 (FIN94) captures the increase in the sensitivity of stock option grants following the 1999 (1994) experiment.

FIN94 takes value 1 if the individual is in the Banking sector after 1994, 0 otherwise. Treated94 takes value 1 for executives in the Banking sector, 0 otherwise. FIN99 takes value 1 if the individual is in the financial services sector after 1999, 0 otherwise. Treated99 takes value 1 for executives in the financial services sector, 0 otherwise.

See Notes to Table 1 for a definition of all other variables and exact samples.

All regressions contain a CEO dummy as well as firm specific individual effects, therefore account for sector, firm and individual permanent unobserved heterogeneity.

| | Opt.grant. | Opt.grant. | Opt.grant. | Opt.grant. |
|---|---|---|---|---|
| | 1 | 2 | 4 | 5 |
| FIN99 | 0.0002 | 0.0004** | | |
| | [0.0001] | [0.0001] | | |
| FIN94 | | | 0.0002* | 0.0005*** |
| | | | [0.0001] | [0.0002] |
| Year dummies | yes | yes | yes | yes |
| Sector dummies | yes | yes | yes | yes |
| Individual effects | yes | yes | yes | yes |
| Sector trend | | yes | | yes |
| Observations | 22841 | 22841 | 9938 | 9938 |

significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: 1999 Financial Services and 1994 Banking Deregulation: Governance

Performance is measured as the log of shareholder wealth.

Columns 1 and 2 (3 and 4) correspond to the 1999 (1994) experiment.

FIN99*Perf (FIN94*Perf) captures the increase in the sensitivity following the 1999 (1994) experiment.

Our measure of good Governance is given by the presence of an institutional investor that holds more than 5% of total equity. FIN94 takes value 1 if the individual is in the Banking sector after 1994, 0 otherwise. Treated94 takes value 1 for executives in the Banking sector, 0 otherwise. FIN99 takes value 1 if the individual is in the financial services sector after 1999, 0 otherwise. Treated99 takes value 1 for executives in the financial services sector, 0 otherwise.

See Notes to Table 1 for a definition of all other variables and exact sample.

All regressions contain a CEO dummy as well as firm specific individual effects, therefore account for sector, firm and individual permanent unobserved heterogeneity.

| | ln(Sal.+Bon.) | ln(Total Comp.) | | ln(Sal.+Bon.) | ln(Total Comp.) |
|---|---|---|---|---|---|
| | 1 | 2 | | 3 | 4 |
| Performance | 0.1343*** | 0.2668*** | Performance | 0.0969*** | 0.2985*** |
| | [0.0133] | [0.0198] | | [0.0215] | [0.0293] |
| FIN99*Performance | 0.0169 | 0.0390* | FIN94*Performance | 0.0278 | 0.0224 |
| | [0.0158] | [0.0233] | | [0.0189] | [0.0240] |
| FIN99 | -0.1972 | -0.3423* | FIN94 | -0.2236 | -0.1368 |
| | [0.1342] | [0.1960] | | [0.1481] | [0.1880] |
| Governance*Perf | -0.0163 | -0.0125 | Governance*Perf | 0.0688*** | 0.0671** |
| | [0.0147] | [0.0220] | | [0.0235] | [0.0309] |
| Govern*Fin99*Perf | -0.0348* | -0.0035 | Govern*Fin94*Perf | 0.0238 | -0.0094 |
| | [0.0191] | [0.0278] | | [0.0247] | [0.0311] |
| Governance*FIN99 | 0.2881* | 0.0269 | Governance*FIN94 | -0.2913 | 0.008 |
| | [0.1571] | [0.2286] | | [0.1940] | [0.2436] |
| Treated99*Perf. | 0.0294* | 0.0453* | Treated94*Perf. | -0.021 | -0.0245 |
| | [0.0166] | [0.0248] | | [0.0286] | [0.0373] |
| Post99*Perf. | -0.0200** | -0.018 | Post94*Perf. | -0.0037 | 0.0258* |
| | [0.0083] | [0.0126] | | [0.0107] | [0.0138] |
| Year dummies | yes | yes | Year dummies | yes | yes |
| Sector dummies | yes | yes | Sector dummies | yes | yes |
| Individual effects | yes | yes | Individual effects | yes | yes |
| Observations | 22157 | 19122 | Observations | 9715 | 8279 |

* significant at 10%; ** significant at 5%; *** significant at 1%

# 7 Appendix

Table 8: Financial Services Sector Deregulation 1999: Pre-Existing Trends on the Slope

| | ln(Total Comp.) | Options grants |
|---|---|---|
| | 1 | 2 |
| 1995 | -0.08* | 0.0004** |
| | 0.044 | 0.0002 |
| 1996 | -0.024 | 0.0002 |
| | 0.04 | 0.0002 |
| 1997 | 0.009 | 0.00008 |
| | 0.038 | 0.0002 |
| 1998 | -0.017 | 0.0002 |
| | 0.037 | 0.0001 |
| 1999 | 0.052 | |
| | 0.035 | |
| | . | . |
| Observations | 13082 | 16247 |

Table 9: Banking Sector Deregulation 1994: Pre-Existing Trends on the Slope

| | ln(Total Comp.) | Options grants |
|---|---|---|
| | 1 | 2 |
| 1993 | -0.105*** | -0.00008 |
| | 0.029 | 0.0001 |
| 1994 | 0.067** | -0.0006*** |
| | 0.03 | 0.0001 |
| | . | . |
| Observations | 3216 | 3847 |