Executive Compensation and Product Market Competition

Vicente Cuñat and Maria Guadalupe

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Abstract
The aim of this paper is to study the effects of product market competition on the explicit compensation packages that firms offer to their executives. In order to measure the net effect of competition we use two different identification strategies. The first exploits cross sectoral variation in concentration ratios and the panel nature of the dataset. The second uses as a quasi-natural experiment the deregulations that occurred in the banking and financial sectors in the nineties and estimates differences in differences coefficients. Our results show that a higher level of product market competition increases the performance pay sensitivity of executive compensation schemes, and they hold through a number of performance measures such as stock options or bonus. The results are robust to a number of specification checks.

JEL codes: M52, L1, J31
Keywords: Executive compensation; product market competition; performance related pay

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Correspondence details: Vicente CuZat, Department of Economics and Buisness, Universitat Pompeu Fabra, Jaume I building, Ramon Trias Fargas, 25-27, 08005-Barcelona, Spain. email: vicentre.cunat@upf.edu. Maria Guadalupe, Department of Economics, MIT, 50 Memorial Drive, Cambridge, MA 02142, USA. email: maria_g@MIT.EDU.

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1 Introduction

A large amount of effort and literature has been devoted to understanding the determinants of executive compensation. The availability of 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. In general, shareholders are considered in this literature as a risk neutral coordinated principal and managers are considered risk averse agents (Holmstrom [1979] Mirrlees [1976] [1974]). The quantity of theoretical work devoted to the topic is extremely large, and there are numerous articles aiming to test empirically the implications of these models (see Murphy 1999 for an extensive survey). However, in spite of all the existing work, there is still considerable controversy on the determinants of executive compensation and their magnitude although what seems to be an established fact is the increase over the past twenty years in performance pay sensitivities and in the use of stock options, that dominate compensation packages for many executives (Hall and Liebman [1998], Murphy [1999]).

Our aim with this paper is to study the effects of product market competition on the explicit compensation packages that firms offer to their executives. This is a relevant question given the increase in product market competition through different channels (from deregulation to technological change and increased trade) over the past decades and because it provides a potential explanation to the increased reliance on performance related pay in executive compensation packages.

Product market competition will 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 (forthcoming)) thus following a change in the competitive environment, firms may decide to reoptimize 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 (Aggarwal and Samwyck 1999, Schmidt 1997). 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 (Bebchuck, Fried & Walker 2002).

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 (in particular the existence of a risk-return trade-off) and the fact that individuals may self-select 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.

First we use concentration ratios which is a standard measure used in the industrial organisation literature and allows for comparison with other empirical papers. However this measure can be criticised from a theoretical point of view (under certain parametrisations of the product market it may not be a meaningful measure of competition) and from an econometric point of view since the degree of concentration may be correlated with an omitted variable in the error term or it may be endogenous to the wage setting for managers. To account for these criticisms we develop most of the analysis using two important deregulation waves in US financial markets as natural experiments. These deregulation episodes are exogenous and more uncontroversial sources of competition that affect particular sectors on particular sample years. We obtain a differences in differences estimator using these deregulatory episodes and check their robustness to different specifications. Our results show that a higher level of product market competition increases the performance pay sensitivity of executive compensation schemes.

The added value of our work is therefore to clarify the direct and indirect effects that competition has on the compensation packages offered to executives. 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 executive compensation, the recent increased reliance on stock options and the increases in sensitivities and the wider implications on the increased variance of earnings are important implications of the paper.

2 Theoretical background

The closest theoretical contributions to our empirical problem are the models by Schmidt [1997] and Raith [forthcoming]. In Schmidt [1997] the explicit contract signed by a risk neutral principal (shareholders) and a risk averse agent (CEO, executive) is influenced by the implicit incentives given by the competitive environment of the firm. The contract induces the manager to exert effort in cost cutting activities. Competition affects the contract 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 have 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 [forthcoming] has a variation on this model that solves the ambiguity. By allowing entry and exit, endogenous exit guarantees that the average profits do not drop like in Schmidtb4s 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.

A decrease in competition may increase the explicit incentives provided in executive contracts to compensate for the reduction on incentives produced by a fall in the bankruptcy risk, however this is not the only mechanism for this correlation. Bebchuk, Fried & Walker [2002] explore the evidence in existing literature for rent extracting activities in managerial compensation and they find a fair number of puzzles that cannot be explained using the standard principal agent theory and 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 managerial compensation. Bertrand and Mullainathan [2000] calculate a measure of "pay for luck"

associated with rent extraction activities on the performance based part of the executive compensation packages. Moreover, they find that this pay for luck is more intense in firms with bad governance.

An important point when assessing the incentives implicit in a compensation package is to assess whether the fixed part of the pay provides incentives. 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. (See Shapiro and Stiglitz 1984).

The few empirical papers that relate product market competition and executive compensation are all in the line of Aggarwal and Samwyck [1999a] (Kedia [1996] 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. This leads to an observed relationship between product market competition and rivals' outcomes[1]. Their empirical analysis uses Execucomp data between 1993 and 1995. They claim to find support for the strategic complements model[2]. Furthermore they

[1]When the actions of the agents are strategic complements (prices in the Bertrand model) the principal's interest is to avoid aggressive price setting and hence they will not compensate managers by their relative performance. On the contrary, managers will be compensated by the own firm performance and the performance of the industry as a whole. As competition (defined by the elasticity of substitution between goods) increases, the weight given to the values of other firms in the compensation contract increases. With strategic substitutes (quantities in Cournot), principals will reward managers positively on own performance and negatively on industry performance. As competition increases,the weight given to the values of other firms in the compensation contract increases (becomes more negative) to induce them to behave more aggressively.

[2]One limitation is that they proxy the elasticity of substitution, that is the measure of product market competition on which the theoretical analysis is based by a Herfindahl index which is a measure of concentration. This is a serious limitation in interpreting the results since concentration and the elasticity of substitution are positively correlated in standard models of competition like the Dixit Stiglitz model. A

find that performance-pay sensitivity is decreasing in the degree of competition measured by this variable. Our work explicitly contradicts this result. The main reasons for this are the inclusion in this paper of a number of explicit control variables in the regressions and the use of a larger sample that covers years 1992 to 2000 -this actually makes most of the difference. We also use two alternative measures of competition, one of which we argue is a true measure of competition (a sector deregulation) that is not contingent on the type of competition in place. As will be shown below we obtain similar results for both measures.

3 Specification and identification strategy

Our aim is to estimate the effect of product market competition on the sensitivity of performance related pay. For this purpose 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$_{fjt}$), a function of performance). 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 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: $A_{ifjt} = f(\text{Competition}_{jt}, \text{individual}_{ifjt}$ & firm characteristics$_{fjt})$ and $B_{fjt} = g(\text{Competition}_{jt}, \text{variance}_f)$. Assuming linear relationships[3], then:

$$W_{ifjt} = A_{ifjt} + B_{fjt}Perf_{fjt} + u_{fijt} \quad (1)$$

higher elasticity of substitution in standard models represents an increase in competition but leads to lower concentration, so the best measure to test their theoretical model is not the Herfindahl index.

[3]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 firmb4s 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]).

$$
\begin{aligned}
A_{ifjt} &= a_0 + a_1 Competition_{jt} + a_2\ var_f + \sum a_z Controls_{ifjt} \\
B_{fjt} &= b_0 + b_1 Competition_{jt} + b_2\ var_f
\end{aligned}
$$

where the slope component depends itself on sector and firm characteristics. Given the compensation structure assumed, the estimation of the compensation equation should include terms where the performance measures interact with competition, rents and other variables. The specification we will estimate is:

$$
\begin{aligned}
W_{ifjt} &= a_0 + a_1 Competition_{jt} + a_2\ var_f + \sum a_z Controls_{ifjt} \\
&\quad + b_0 Perf_{fjt} + b_1 Competition_{jt} Perf_{fjt} + b_2 var_j Perf_{fjt} + u_{fijt}
\end{aligned} \tag{2}
$$

$$
u_{ifjt} = \eta_i + \delta_j + d_t + \epsilon_{it} \tag{3}
$$

Where $Perf_{fjt}$ is performance, var_f is the variance of the performance measure, $Competition_{jt}$ is the relevant competition measure, d_t are time dummies, η_i and δ_j are individual and sector permanent unobserved components and ϵ_{it} is a white noise.

The specifications are fixed effects regression of the levels of different compensation measures on levels of performance measures (we later use the logarithm of compensation as dependent variable as a robustness check). It therefore estimates the sensitivity of pay to performance (Murphy [1999]). 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. This captures the net effect of competition from the different channels outlined in the previous section.

The estimation must account for other sources of variation of the performance pay sensitivity that might be correlated with the level of competition and hence bias the coefficient. We explicitly introduce the variance of performance, since in the standard principal agent model the limiting factor to a very steep incentive contract is the risk aversion of the agent and the fact that the returns of the firm depend not only on her effort, but also on other random factors (therefore one expects b_3 to be negative[4]). In fact omitting the variance term

[4]This effect may however be less clear when we introduce measures of granted options in our compensation package, as the valuation of these options depends positively on the volatility of the underlying shares

biases the estimate of the performance sensitivity towards zero. We also account explicitly for the size of the firm (to isolate the firm size effect).

The level of variation of competition is at a sector level, and we identify b_1 by comparing two individuals working in firms with the same level of performance in sectors with different levels of competition. Now one must take into account any other biases arising from the correlation between any permanent unobserved component of the wage equation and the included regressors.

First of all we account for permanent unobserved differences between sectors. If the sector fixed effects δ_j are correlated with $Competition_{jt}Perf_{fjt}$ for instance because highly competitive sectors pay higher wages regardless of the level of performance, this will bias the results. Given that our interest variable (i.e. competition) is a sector characteristic, our main specification will include sector fixed effects δ_j. If the above specification is correct, then provided $Cov((Competition_{jt}Perf_{fjt}), \eta_i) = 0$ the coefficient of interest will be unbiased. However there are reasons to expect that is not true, in particular if managers select themselves towards sectors with lower levels of competition that have higher rents and pay higher wages. In that case b_1 will underestimate the effect of competition on performance pay sensitivities (so this bias goes in our favour). In the sample, 2.4% of the individuals actually change firms at least once, and only one third of these are within sector changes. Note that given that we are dealing with the market for executives in the top 1500 firms in the US, there are strong reasons to believe that the labour market for executives is not restricted to the sector, but that there is considerable flexibility for managers to migrate between sectors[5].

The second strategy used is therefore to control additionally for individual fixed effects. The cost of this strategy is that there may not be enough individual variation to capture the effects and that the loss in efficiency from including individual fixed effects is large. The average number of observations per executive is just 3.8 and individual fixed effects implicitly mean losing one degree of freedom per individual. The advantage though is that movers from one sector to another provide useful variation to identify the effect of competition since

[5]Furthermore in the section that uses concentration ratios sectors are defined at 5 digit NAICS level, which is a quite narrow definition of sector, so sector changes are frequent and if these changes are correlated with η_i this will bias the results.

our measure of concentration only varies by sector (the experiments will have time series variation) and hence they allow us to compare the same individual in sectors with different levels of competition[6]. Furthermore, it is still possible that individuals self select towards particular firms within their sector according to their skills in a systematic way. Individual fixed effects deal with these issues.

The above comments concerned the model specification. However, the most important aspect of the analysis probably concerns the measure of product market competition used. We pursue two different strategies. The first is to use concentration ratios for the four largest firms in the sector at NAICS 5 digit level obtained from the US census of manufacturers for 1997. The variation in concentration is purely cross-sectional and we use this measure to start with because it is a standard measure of competition used in previous studies. However, the use of concentration ratios may be subject to a number of criticisms. First, under some parametrisations of competition, concentration is a very imperfect measure of the competitiveness of the sector. Furthermore there are measurement issues on how these ratios should be measured. 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.

To address these issues we use an alternative measure of changes in competition that exploits the two deregulation Acts that were passed in the US in the nineties to deregulate the financial services. These are explained in the next section.

3.1 Two quasi-natural experiments: Financial deregulation in the 90's

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.

The first one was the 1994 Riegle-Neal interstate banking and Branching Efficiency Act 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 an increase in product market competition. Prior to that there where restrictions for banks

[6]The results go through when we look at stayers only. Some results for stayers are shown later on on the robustness checks section.

to operate across borders (although there were limited agreements between some states). While the empirical literature on the impact of these reforms is still limited, there seems to be a consensus between practitioners and academics on the increase of competition that it generated and the pressure on inefficient banks that held local monopolies before. e.g. "The lobbying force behind banking restrictions is widely known to be *the preservation of local monopolies or oligopolies for community banks*" (Kane [1996] commenting on Golenbe [1994] (in italics)). In addition, studies on similar reforms (the bilateral state agreements) for earlier periods seem to find a considerable impact on the sector[7]. The fact that this is the most wide-ranging reform of the kind for the US since it affects the whole country indicates 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 and 1994) to those after 1994 (1995 to 1996).The treatment sector is the banking sector (SIC code at two digits is 60).

The second major reform to the financial industry regulation was brought about in 1999 with the Gramm-Leach-Bliley Act also known as the financial services modernisation 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. The effect on the financial services industry was considered as rather dramatic: "Since congress passed [...] the Gramm-Leach-Bliley act the financial services industry has undergone a dramatic change as it explores developing the best mix of products and services that can be offered to customers.[...] investors, institutions and companies are quickly benefiting form enhanced organizational agility and greater competition in the industry. Allan E. Sorcher (Vice-President of the Securities Industry Association).

Thus our second test period are the years between 1997 and 1999 versus year 2000. The treatment group here is made by firms in sectors with SIC codes 60 to 64 and 67. They constitute natural experiments that affect only particular industries after a given year and

[7]Nichols and Hendrickson show the impact of previous deregulation waves from 1929 to 1989 using Canadian banks as a benchmark for US reforms and viceversa. The freedom to establish new branches seems to have contributed to higher levels of efficiency.

therefore can be used to identify the effects of competition.

Exploiting this variation we implement a differences in differences estimation of the effect of the increase in competition in the US financial sector following the two legislation pieces. These deregulations constitute our preferred specification (relative to the one using concentration ratios) because they exploit a clear measure of an increase in competition. The estimated compensation equation now is:

$$\begin{aligned} W_{ifjt} &= a_0 + a_1 DEREG_{jt} + a_2\ var_f + \sum a_z Controls_{ifjt} \\ &\quad + b_0 Perf_{fjt} + b_1 DEREG_{jt} Perf_{fjt} + b_2 var_j Perf_{fjt} + u_{fijt} \end{aligned} \tag{4}$$

$$u_{ifjt} = \eta_i + \delta_j + t\delta_j + d_t + \epsilon_{it} \tag{5}$$

The deregulation indicator $DEREG_{jt}$ takes value one for the treated sectors (banking in the 1994 deregulation or financial services in the 1999) in the treatment period (post 1994 and post 1999 respectively). As before, results will be presented with sector and both sector δ_j and individual η_i fixed effects. Now, given the effect of the deregulations arises over time, it is important to ensure that we are not just capturing the fact that different sectors have different trends in performance pay. To control for this possibility, sector specific time trends are introduced $t\delta_j$. This will capture any differing time trends by sector.

In addition to the basic specifications with the natural experiments we do a number of robustness checks.

The first robustness check is to run the analysis only on the services industry (SIC codes 60 to 81). This is a much closer comparison group than the one used before, and one would expect that the performance pay sensitivities evolve similarly. By taking the rest of services as a benchmark we are possibly able to more closely identify the effect of the deregulation (although the inclusion of a sector trend accounted to a large extend for these potential between sector differences).

The second check is to use the logarithm of total compensation instead of its level as a dependent variable.

The third check is to introduce explicitly a measure of rents in the regression. The reason for this is that in addition to these pure competition effects we also expect that

rent extraction activities may affect the compensation package offered to executives. In principle higher rents should increase the fixed component of the 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). As will be seen below, the results indicate that the sensitivity increases with competition, so if anything omitting rents would increase that coefficient. In addition to this, the risk of using the rents measure is that it may be endogenous if we think that the level of managerial pay affects rents. The support for this is rather limited (managerial pay is a tiny fraction of rents). As we will see measure of rents used has an almost negligible 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. Finally, the results are presented on stayers exclusively.

4 Data description

To develop the analysis outlined above we use the Standard&Poor's Execucomp dataset. This is a panel dataset that covers up to the top 5 executives (ranked by salary and bonus) of the top firms in the US economy (it includes all of the S&P 1500, and a few other large firms). We use yearly data from 1992 to 2000. It records exhaustive data on executiveb4s compensation schemes as well as some individual characteristics[8]. The individual level data on compensation includes yearly wage, bonus, stock 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 (our accounting profits measure), total market return (dividend plus appreciation) of holding all stock during the year. The full sample contains around 95000 observations that correspond

[8]There is also a limited amount of individual characteristics. We will use gender. Age and tenure are only a vailable for a very limited number of observations, and the criteria of selection are not clear, so we decided not to include these.

to 22000 individuals.

To construct the competition variables we obtained concentration ratios from the 1997 US Economic Census (published by US Census) at different levels (the share of production of the top four, eight, twenty and fifty firms in a given sector). These measures are computed at the NAICS 5 digit level and we use the top four concentration ratio throughout since at this high level of disaggregation it is the magnitude with more variation. The top four concentration ratio is the proportion of total sector revenue accounted for by the largest four firms in the sector. The average concentration ratio in the sample is 30%.

We also use an alternative competition measure that comes from 2 deregulation episodes in the banking and financial sectors. The Riegle-Neal interstate banking and Branching Efficiency Act, published in 1994 increased interstate competition between commercial banks, and the Gramm-Leach-Bliley Act also known as the financial services modernisation act meant a drastic liberalisation of financial services in 1999. Both of them affect particular sectors in particular periods of time, so we can use them as natural experiments following a differences in differences procedure. To avoid the interference between both natural experiments we use the period 1993-1994 as the control sample for the first experiment (banking sector) and 1995-1996 as the treatment period. For the second experiment (financial services sector) we will use 1997-1999 as control sample and 1999-2000 as treatment period.

With these data a number of econometric specifications were evaluated and the results are described below. The aim is to evaluate the effect of competition on variations in the variable component of the compensation scheme. For this purpose we use as dependent variables three different magnitudes that capture this variable component. First we used total executive compensation earned by the executive in a given year including the profit from exercising stock options in that year (and excluding options granted). Second, we use salary plus bonus (to abstract form the impact of stock options). Finally we used the Black-Sholes value of options granted[9].

[9]A comment is in order on the use of stock options granted as a dependent variable. Stock options are an increasingly important component of executive compensation. However, given their magnitude and volatility, it is problematic to analyse them jointly with other compensation items. It is important when dealing with stock options to value them adequately, especially given that granting stock options is at the same time a reward for performance and an incentive device in itself.

There are two main ways to deal with options in this environment. One possibility is to consider the value of the options granted as a sum of money given to the executive. This possibility is particularly attractive

We then evaluate the effect of accounting and market returns separately on these compensation measures. All variables are at constant 1996 prices. Even though corporate finance would predict that market returns are the relevant magnitude in this respect, previous research points to the fact that accounting profits are also relevant (Bushman and Smith 2001).

Accounting returns are measured as earnings before interest and taxes and market returns are total market returns (dividend plus appreciation) of holding the stock during the year.

Since risk must be accounted for when estimating compensation sensitivities the variance of the return is computed over the sample period. The relevant risk measure is the variance of performance since that is the risk faced by the variable component of pay[10]. We compute a variable that is the sample cumulative density of the variance of the returns of the firm. This is a measure of the relative position of the firm variance with respect to the variance of returns of other firms that smooths the measure of the variance such that it contains no outliers. This is our risk measure throughout the paper.

The robustness checks include a measure of the rents available to the firm to account for the feasibility of rent extraction. Given the available data this is defined as a markup measure computed as profits before interest, taxes and extraordinary items over sales[11]. The size of the firm is also controlled for by the logarithm of assets.

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if executives already hold a portfolio of the firmb4s shares and can rebalance it to keep an optimal exposure to the firmb4s risk or if they can trade on derivatives to achieve the same goal. However if such portfolio cannot "absorb" the amount of stock options granted and there is not a liquid market for such options this approach does not take into account that the number of options granted, not only has some intrinsic value but also this value is sensitive to the firmb4s performance. In this latter case it is also true that using the Black-Scholes formula to value these options may overstate their value, as it is not taking into account the illiquidity of these options and the limited diversification strategies available (Hall and Murphy [2000]).

Another possibility would be to calculate the aggregate sensitivity of the value of all granted options to firm performance (overall delta) and consider them as an incentive contract. This strategy has two limitations: a practical limitation, as with the available data it is hard to measure this aggregate sensitivity and a limitation related to the extent to which executives can "undo" this incentive contract by rebalancing their portfolios. Throughout this paper we take a pragmatic approach, showing regressions explaining total compensation (including options executed) and options granted (at B&S value).

[10] In principle managers could have a well diversified port-folio in which case the relevant measure of risk would be the covariance of performance with the stock market divided by the varaince of market returns (the betas). In practice manager's human capital and assets are heavily invested in the firm and the variance of risk is a more relevant risk measure.

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

We also include as explanatory variables gender and whether the individual is the companyb4s CEO. All regressions include year dummies to account for the cyclicality of compensation.

A main concern in the analysis was that many of the dependent and independent variables used typically have very large outliers. This is problematic when running ordinary least squares-type regressions. To deal with this issue we restricted somewhat the sample and dropped the top outliers[12] of options granted and total compensation. The results are not sensitive to the exact cut-off point chosen. It is only the inclusion of very large option grants or total compensation that alters the results. Previous analysis using median regressions to minimise the impact of outliers was consistent with these results. However the impossibility to account for individual fixed effects in those regressions (and the relevance of accounting for unobserved heterogeneity that is confirmed by the results) is what lead us to have least squares regressions without outliers as our preferred specification.

5 Results

In this section we present the results obtained for the determinants of managerial compensation, in particular of total compensation (including options executed) and stock options granted. We estimate equation (1) and present the sensitivity analysis and robustness checks progressively.

5.1 Analysis using concentration ratios

The results in this section use as competition measure concentration ratios by sector. These are at highly disaggregated sector levels for 1997.

Tables 2 to 4 present results using accounting returns as the measure of performance for the equation on Total Compensation, Salary plus bonus and Options granted respectively.

[12]The sample was restricted by excluding from the analysis executives with very large outliers of either total compensation or options granted. The 99% cutoff point for total compensation the sample was 14887, but the maximum value was 655717 (respectively 11001 and 557529 for granted options) -the minimum in either case being zero. The enormous weight of these variables in a least squares framework led us to drop variables with total compensation greater than 30000 and options granted greater than 24000 (these values were chosen at above the 99% cutoff point to include roughly 0.3% of the sample). In total this amounts to 528 observations, i.e, 0.6% of the total sample.

Tables 5 and 7 use market returns as measure of performance. Columns 1 and 2 contain sector fixed effects only. Column 3 contains individual fixed effects in addition to the sector dummies.

As is well known in this setting it is crucial to control for the fact that the level of compensation will depend on the risk associated to the contract, to the performance of the company. Hence we introduce the variance of the relevant performance measure in the regressions in column 2 of all tables. When this is interacted with the performance measure in levels we find that the sensitivity of pay to performance is decreasing in the variance of the firm. Again, this is true for accounting profits and market returns.

To summarise the results, the performance pay sensitivity is increasing in the performance measure and levels off after some point (has a very smooth hump shape). Concerning the effect of product market competition on incentives provided we find that the estimated coefficient $\widehat{b_1}$ on the interaction between concentration and returns is negative and significant in most specifications. This indicates that more competitive sectors provide steeper incentives to their managers and hence that the incentive provision effect dominates the market discipline effect in net terms. Let's see now in more detail the results obtained.

On the effect of competition on the sensitivity of total compensation to accounting profits (table 2) the first thing to note is that the estimate changes substantially from the sector effects to the individual fixed effects model (indicating selection on unobservables for that magnitude), actually more than doubling the estimated sensitivity. This suggests a negative correlation between the individual fixed effect and accounting returns (the same qualitative results apply to the salary plus bonus specification). In the fixed effects specification an increase in a million dollars in accounting returns increases total compensation by 5702 dollars. The effect of competition on this sensitivity is to increase it by 5% if one goes from a concentration ratio of one -where the four largest firms dominate the whole market- to a highly competitive sector (with close to zero CR4). The increase in sensitivity of salary plus bonus due to competition is around 2% and that of stock options is 11%[13].

Concerning the sensitivity of total compensation to market returns with minimal concentration, it around 1300 dollars for every extra million dollars in market returns. This is

[13] All effects in what follows are computed at the median where the effect of the variance term of the performance measure is negligible with respect to the coefficient on performance in levels.

reduced by 3% if we consider a monopoly in the sector fixed effects specification (column 2). The average market return is around 700 million dollars, that gives a variable pay at mean market return of 910 thousand dollars per annum. In a monopolistic sector this is reduced by 27300 dollars. In the individual fixed effects regression the sensitivity of pay to performance is very similar (indicating no selection on unobservables with respect to market returns). However significance is lost for the effect of product market competition.

The effect of competition on stock options granted is substantial. In all tables we find that only when we introduce individual fixed effects the effect of product market competition becomes significant suggesting a negative correlation between the competition/performance interaction and the fixed effect. In the individual fixed effects specification concentration reduces the sensitivity by 11% in the accounting and 20% in the market returns cases.

The size of the firm (measured by the log of assets) affects positively both total compensation and options granted. It is interesting to note that the estimate of that effect changes substantially (it double or triples) when we allow for individual fixed effects. This suggests a negative correlation between the individual fixed effect and the size of the firm.

Finally we controlled for gender and whether the individual was the CEO of the company. Men represent 96% of the sample and they earn significantly more than women (around 250 thousand dollars more on average). CEOs also earn more than non-CEOs by whichever measure we measure compensation. In the individual fixed effects specification (that estimates the impact of being a CEO exclusively through changers of CEO status) the effect is around 200 thousand dollars total compensation and 350 thousand dollars more options granted for CEOs.

5.2 A natural experiment: Deregulation in the 90's

The previous section showed that competition measured by concentration ratios tends to increase the steepness of pay-performance contracts offered to executives. An extensive set of controls and fixed effects regressions were used to control for as many observable and unobservable factors as possible. However, as was mentioned before, concentration ratios may be objected to on the grounds that they are an imperfect measure of competition or that they may be correlated with some omitted variable leading to omitted variable bias.

This section uses two quasi- natural experiments to address these problems and confirm the results.

Given that these deregulation processes only affected particular industries in given periods, the identification strategy is based on a differences in differences estimation. Control variables identical to the ones used in the previous section are included in the regressions. To avoid spurious results that could be driven by the fact that different sectors are subject to different trends independently from the experiment we also include sector specific time trends for all sectors.

The results can be seen in tables 8 to 12**.** Estimates are shown for total compensation (columns 1 and 4), salary plus bonus (columns 2 and 5) and options granted (columns 3 and 6). Columns 4 to 6 include individual fixed effects. The variables FIN and FIN94 take value 1 in the treatment periods for the sectors that experienced deregulation and 0 for the control sample and the pre-treatment period. FIN94 corresponds to the effect of the Riegle-Neal interstate banking and Branching Efficiency Act between 1994 and 1997 and FIN corresponds to the effect of the Gramm-Leach-Bliley Act from 1999 to 2000. These same variables also interact with the performance levels of firms to see the effect of deregulation on the pay-performance slope.

In all specifications we find that after the deregulation, the slope of performance related pay becomes steeper. The coefficient is both quantitatively important and statistically significant. The positive sign shows how the pay-performance sensitivity increased after deregulation happened, thus confirming our results of section (5.1). Whether we look at total compensation, salary plus bonus or options granted, and whether we use accounting profits or market returns as our performance measure the result seems to be confirmed. This is true including individual fixed effects and a sector specific trend in the regressions (only the specification for options granted loses significance when we introduce individual fixed effects). Quantitatively the effect is also very large, for example, table 8 shows that the market pay performance sensitivity is 31% higher in the treated (banking) sector after the deregulation than before. Table 9 shows that the pay performance sensitivity to accounting returns increases by 12% post deregulation.

Similar results are shown in tables 9 and 11 for the 1999 deregulation of financial services. The sensitivity of total compensation to market returns is increased by 15% in the

financial services sectors after deregulation. That of salary and bonus increased by 11% and that of options granted by 42%. For accounting profits the effects are 9%, 13% and 13% respectively. Higher levels of competition are therefore here again associated with steeper incentive schemes.

Note also that in most specifications there is a negative and significant effect of the deregulation on the level (i.e. non performance based) part of the compensation package. This may be due to the fact that the deregulation lowered profits and reduced the possibility of rent extraction. It therefore provides indirect supporting evidence that the experiments are actually capturing an increase in product market competition since this is the effect one would expect.

Robustness checks of these basic specifications are presented on tables 10 and 13. These are for total compensation as dependent variable and market returns as performance measure (so it should be compared to column 4 of the corresponding deregulation table with market returns as performance measure). The first column of tables 10 and 13 restricts the analysis to the services industries (including financial and other services instead of taking as benchmark all other sectors of the economy). By taking sectors that are closer to the deregulated industries the benchmark is stricter (although the inclusion of a sector trend deals with this in a parametric way). The results are almost unchanged with respect to the previous analysis (only the sensitivity to market returns is somewhat reduced).

The second column takes the logarithm of the dependent variable and results are qualitatively unchanged.

The third column introduces a measure of rents (computed as net income over sales). As we mentioned before the fact that profits may fall as competition increases implies that performance pay sensitivities may be reduced (because of reduced return to effort form the fall in profits or because reduced rent extraction). To address to what extent this mechanism plays a role we introduce explicitly a measure of rents in column 3. Our coefficient of interest is again robust to introducing rents which indicates that omitting this variable does not affect the results.

Finally, the fourth column restricts the analysis to stayers. This restricts the identification of the effect to workers who were in the deregulated industries prior to deregulation and that underwent it. In the specification with movers, the effect was also identified through

workers who moved into the deregulated sectors after deregulation. If these changes are correlated with some unobserved characteristic, the coefficient will not be capturing the causal effect of competition on performance pay sensitivities. Again, the results on the variable of interest are unchanged.

The results are robust to all these checks and the overall evidence from these experiments indicates that the increase in competition reduced the fixed component of pay and increased the sensitivity of the variable component.

6 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 market 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 show that the net effect of product market competition is to increase the performance pay sensitivity, indicating that as competition increases managers will be faced with steeper explicit incentives. This is true after controlling for the implicit risk in the economic environment faced by the manager. The results are also robust to different measures of product market competition. In particular, we use two deregulation experiences as a natural experiment in which a dramatic increase of the competition levels happened for a subsample of firms. The results using this measure are highly significant and robust to a number of different specifications. Furthermore they do not differ qualitatively from the ones using a standard concentration ratio index.

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 used of these compensation mechanisms. It also indicates that the dispersion of earnings in the economy is likely to increase as product markets become more competitive and hence this can be an additional explanation for the

recent increase in earnings inequality. Direct tests of these issues are left for future research.

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7 Tables

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Median	Minimum	Maximum
Salary	95545	305.17	207.77	250	0	4065.1
Bonus	95545	237.26	500.29	108	0	14276
Total comp.	95545	1158.02	2173.68	512.0	0	29988.38
Salary+bonus	95545	542.44	620.96	370.8	0	15251
Options granted	80766	640.26	1679.23	139.7	0	23991.26
Conc. ratio top4	86131	0.30	0.15	0.28	0.007	0.89
CR4*mkt. ret.	73420	24818.8	217942.3	1689.6	-5995770	7680000
CR4*acc.prof	85765	102.54	421.84	16.6	-3180.04	11643.2
Acc. profits (million US dollars)	95170	293.40	978.92	65.5	-9026	27493
Acc. profits sqd. (million US dollars)	95170	995935.1	1.05e+07	6193.6	3.95e-06	6.52e+08
Market returns $(10,000s$ US dollars)	81540	70479.8	548955	7110.3	-1.09e+07	2.08e+07
Market returns sqd $(10,000s$ US doll.)	81540	3.06e+11	5.53e+12	5.13e+08	0	4.31e+14
Var. (cdf) profits	95514	0.51	0.28	0.5	0	1
Var. (cdf) mkt.ret.	93336	0.50	0.28	0.5	0	1
Rents	95067	-.09	6.11	0.054	-670.36	232.7
ln assets	95247	7.08	1.77	6.9	-3.07	13.26
CEO	95549	0.13	0.34	0	0	1
male	95549	0.96	0.18	1	0	1
Var.acc.prof*acc.prof	95144	249.40	962.87	25.03	-9026	27448.03
Var. mkt.ret.*mkt.ret.	81025	65017.7	542141.3	1622.6	-1.09e+07	2.07e+07

Table 2: Effect of acc. profits and concentration on total compensation

	(1)	(2)	(3)
	Total Comp.	Total Comp.	Total Comp.
Acc. profits	0.5704***	2.0769***	5.7121***
	(29.20)	(13.97)	(21.73)
Acc. profits squd.	-2.4e-6*	2.0e-6	2.5e-6*
	(1.91)	(1.52)	(1.69)
CR4*acc. prof.	-0.3642***	-0.3213***	-0.2895***
	(8.76)	(7.74)	(4.06)
ln assets	342.2036***	197.8142***	533.5037***
	(59.28)	(22.16)	(29.68)
ceo	1,339.37***	1,344.08***	216.89***
	(68.81)	(69.21)	(7.03)
Male	238.3880***	242.1911***	
	(6.67)	(6.79)	
Variance prof.		871.35***	-200.84
		(20.49)	(1.03)
Var. prof*acc.		-1.56***	-5.14***
		(10.27)	(19.04)
Constant	-1,983***	-1,421***	-2,465
	(33.91)	(22.18)	(1.10)
Time dummies	yes	yes	yes
Sector dummies	yes	yes	yes
Individual effects	no	no	yes
Observations	85765	85739	85739
Number of sect.	333	333	
R-squared	0.18	0.18	0.13
Number of indiv.			19138

Absolute value of t statistics in parentheses

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

Table 3: Effect of acc. profits and concentration on salary plus bonus

	(1)	(2)	(3)
	Sal+bonus	Sal+bonus	Sal+bonus
Acc. profits	0.2024***	0.7432***	1.7342***
	(42.48)	(20.49)	(36.99)
Acc. profits squd.	-4.7e-6***	-3.2e-6***	-1.6e-6***
	(14.98)	(9.93)	(6.16)
CR4*acc. prof.	-0.1285***	-0.1162***	-0.0305**
	(12.68)	(11.47)	(2.40)
ln assets	124.9530***	92.7460***	11.6399***
	(88.76)	(42.60)	(3.63)
ceo	579.2479***	579.9217***	220.8892***
	(122.03)	(122.43)	(40.14)
Male	82.6519***	82.9749***	
	(9.48)	(9.53)	
Variance prof.		181.8449***	397.8593***
		(17.54)	(11.42)
Var. prof*acc. prof		-0.5607***	-1.6029***
		(15.08)	(33.24)
Constant	-629.0431***	-502.2700***	333.9345
	(44.11)	(32.13)	(0.84)
Observations	85765	85739	85739
Time dummies	yes	yes	yes
Sector dummies	yes	yes	yes
Indiv. effects	no	no	yes
Number of sectors	333	333	333
R-squared	0.32	0.32	0.24
Number of indiv.			19138

Absolute value of t statistics in parentheses

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

Table 4: Effect of acc. profits and concentration on options granted

	(1)	(2)	(3)
	Options grant.	Options grant.	Options grant.
Acc. profits	0.1071***	-0.2642**	1.2875***
	(6.15)	(2.07)	(5.40)
Acc. profits squd.	7.3e-6***	6.9e-6***	4.4e-6***
	(6.54)	(5.97)	(3.24)
CR4*acc. prof.	-0.0648*	-0.0548	-0.1478**
	(1.79)	(1.52)	(2.34)
ln assets	242.9377***	142.3704***	355.9343***
	(46.69)	(17.65)	(20.87)
ceo	758.9020***	760.9737***	347.0298***
	(47.57)	(47.84)	(13.24)
Male	70.2694**	75.6455**	
	(2.13)	(2.30)	
Variance prof.		672.2337***	-421.3920**
		(17.87)	(2.44)
Var. prof*acc. prof		0.3814***	-1.0211***
		(2.91)	(4.13)
Constant	-1,612.96***	-1,214.43***	-1,721.26
	(29.85)	(20.48)	(0.70)
Time dummies	yes	yes	yes
Sector dummies	yes	yes	yes
Individual effects	no	no	yes
Observations	72482	72456	72456
Number of sectors	333	333	333
R-squared	0.11	0.12	0.08
Number of indiv.			19104

Absolute value of t statistics in parentheses

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

Table 5: Effect of market returns and concentration on total compensation

	(1)	(2)	(3)
	Total Comp.	Total Comp.	Total Comp.
Market return	0.0006***	0.0136***	0.0132***
	(14.54)	(34.10)	(32.54)
Market ret. squd.	3.5e-12*	1.8e-11***	2.2e-11***
	(1.92)	(10.03)	(11.15)
CR4*market ret.	-0.0006***	-0.0003***	-0.0000
	(6.47)	(3.02)	(0.00)
ln assets	477.7028***	317.5006***	675.3671***
	(79.47)	(36.18)	(28.43)
ceo	1,346.8148***	1,355.2711***	191.3208***
	(64.64)	(65.85)	(5.03)
Male	246.7655***	253.1776***	
	(6.20)	(6.44)	
Variance*market ret.		-0.0134***	-0.0132***
		(32.78)	(31.78)
Variance market		1,000.7254***	-40.4610
		(22.25)	(0.17)
Constant	-3,066.92***	-2,457.03***	-3,498.35
	(49.24)	(37.06)	(1.26)
Time dummies	yes	yes	yes
Sector dummies	yes	yes	yes
Individual effects	no	no	yes
Observations	73370	72904	72904
Number of sectors	331	327	
R-squared	0.17	0.19	0.12
Number of individuals	.		18422

Absolute value of t statistics in parentheses

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

Table 6: Effect of market returns and concentration on salary plus bonus

	(1)	(2)	(3)
	Salary+bonus	Salary+bonus	Salary+bonus
Market return	0.0001***	0.0024***	0.0023***
	(12.57)	(24.69)	(31.52)
Market ret. squd.	-1.3e-12***	1.2e-12***	3.0e-12***
	(2.87)	(2.65)	(8.29)
CR4*market ret.	-0.0001***	-0.00005**	-0.000008
	(4.55)	(2.10)	(0.43)
ln assets	173.0780***	159.0564***	45.6089***
	(117.67)	(73.79)	(10.62)
ceo	589.3344***	590.1983***	251.0295***
	(115.59)	(116.75)	(36.52)
Male	79.8776***	82.6025***	
	(8.20)	(8.55)	
Variance*market ret.		-0.0024***	-0.0023***
		(23.50)	(30.45)
Variance market		76.6788***	354.52***
		(6.94)	(8.19)
Constant	-973.8***	-921.6***	122.6
	(63.90)	(56.60)	(0.24)
Time dummies	yes	yes	yes
Sector dummies	yes	yes	yes
Individual effects	no	no	yes
Observations	73370	72904	72904
Number of sectors	331	327	
R-squared	0.30	0.31	0.19
Number of indiv.			18422

Absolute value of t statistics in parentheses

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

Table 7: Effect of market returns and concentration on options granted

	(1)	(2)	(4)
	Options grant.	Options grant.	Options grant.
Market return	0.0000	0.0023***	0.0015***
	(1.29)	(6.73)	(4.31)
Market ret. squd.	2.3e-11***	2.6e-11***	1.9e-11***
	(15.11)	(17.35)	(10.00)
CR4*market ret.	0.0000	0.0001	-0.0003***
	(0.13)	(0.66)	(2.92)
ln assets	287.1187***	133.8204***	355.3578***
	(55.90)	(17.94)	(16.74)
ceo	761.3032***	765.2617***	335.3355***
	(45.61)	(46.54)	(10.80)
Male	85.0443**	93.0642***	
	(2.40)	(2.67)	
Variance*market ret.		-0.0023***	-0.0014***
		(6.64)	(3.80)
Variance market		1,020.4509***	483.3271**
		(26.91)	(2.32)
Constant	-1,039.07***	-1,385.13***	-1,938.96
	(20.18)	(24.18)	(0.77)
Time dummies	yes	yes	yes
Sector dummies	yes	yes	yes
Individual effects	no	no	yes
Observations	63872	63408	63408
Number of sectors	331	327	
R-squared	0.11	0.13	0.07
Number of indiv.			18388

Absolute value of t statistics in parentheses

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

Table 8: Deregulation of the banking sector 1994, market returns

	(1)	(2)	(3)	(4)	(5)	(6)
	Total comp.	Salary+bon.	Options gr..	Total comp.	Salary+bon.	Options gr.
Market return	0.0061***	0.0018***	-0.0018***	0.0070***	0.0020***	-0.0003
	(10.99)	(10.52)	(3.76)	(11.77)	(16.07)	(0.47)
Market ret. squd.	-4.4e-11**	-1.9e-11***	-5.6e-11***	5.2e-11***	2.3e-12	-1.2e-11
	(2.37)	(3.59)	(3.65)	(2.96)	(0.62)	(0.71)
fin94	-561.92***	-164.92***	-220.08**	-504.36***	-94.70***	-163.60
	(4.19)	(4.00)	(2.04)	(4.50)	(4.01)	(1.57)
fin94Xmktret	0.0022***	0.0011***	0.0004***	0.0022***	0.0007***	-0.0000
	(11.86)	(19.79)	(2.73)	(10.29)	(14.93)	(0.16)
Variance*mk. ret.	-0.0052***	-0.0016***	0.0022***	-0.0065***	-0.002***	0.0005
	(8.84)	(9.13)	(4.55)	(10.45)	(14.97)	(0.74)
Variance market	783.29***	113.88***	686.30***	533.57**	488.65***	219.87
	(21.35)	(10.09)	(22.64)	(2.32)	(10.12)	(0.92)
ln assets	162.41***	122.58***	24.28***	350.98***	34.67***	29.93
	(22.61)	(55.48)	(4.06)	(12.04)	(5.65)	(1.02)
ceo	1,174.55***	553.19***	536.59***	137.13***	180.97***	109.17***
	(59.38)	(90.93)	(34.82)	(3.51)	(22.05)	(3.13)
Male	136.73***	72.53***	8.44			
	(3.23)	(5.57)	(0.22)			
Constant	-127,635***	-63,847***	-153,660***	-143,329	-44,782	-6,714
	(8.87)	(14.42)	(12.85)	(0.83)	(1.23)	(0.02)
Observations	39484	39484	33844	39484	39484	33844
Time dummies	yes	yes	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes	yes	yes
Sector trend	yes	yes	yes	yes	yes	yes
Indiv. effectc.	no	no	no	yes	yes	yes
Number of sic2	61	61	61	61	61	61
R-squared	0.21	0.34	0.09	0.09	0.15	0.03
Number of indiv.	14161	14161	12975	14161	14161	12975

Absolute value of t statistics in parentheses

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

Table 9: Deregulation of the banking sector 1994, accounting profits

	(1)	(2)	(3)	(4)	(5)	(6)
	Total comp.	Sal+bonus	Options gr.	Total comp.	Sal+bonus	Options gr.
Acc. profits	1.3980***	0.4828***	-0.3659***	3.8495***	1.6770***	0.8158***
	(8.92)	(10.55)	(2.89)	(12.20)	(27.16)	(2.76)
Acc. profits squd.	1.1e-6	-3.5e-6***	1.3e-7	0.00002***	4.7e-6***	2.6e-6
	(0.56)	(6.28)	(0.08)	(7.49)	(8.19)	(0.84)
fin94	-212.49*	-107.50***	-196.20**	-247.13***	-67.32***	-166.19**
	(1.95)	(3.38)	(2.29)	(2.60)	(3.62)	(2.02)
fin94Xpre	0.4960***	0.2293***	0.1024***	0.4773***	0.1209***	0.0514
	(11.43)	(18.10)	(3.05)	(9.78)	(12.66)	(1.24)
Variance prof.	722.66***	116.23***	528.60***	232.07	290.75***	259.84
	(19.50)	(10.74)	(17.28)	(1.14)	(7.33)	(1.36)
Var. prof*acc. prof	-1.1117***	-0.3753***	0.4404***	-3.6427***	-1.5984***	-0.7951***
	(6.95)	(8.03)	(3.39)	(11.30)	(25.34)	(2.62)
ln assets	117.4362***	90.8302***	33.8528***	213.9012***	4.0159	28.3626
	(15.54)	(41.16)	(5.33)	(10.36)	(0.99)	(1.44)
ceo	1,180.88***	543.83***	534.34***	73.38**	150.00***	139.65***
	(62.02)	(97.78)	(36.95)	(2.48)	(25.92)	(5.45)
Male	124.53***	73.37***	-14.39			
	(3.26)	(6.57)	(0.43)			
Constant	-25,306**	-36,689***	-109,613***	-115,975	-34,735	-39,312
	(2.31)	(11.49)	(11.68)	(0.86)	(1.32)	(0.21)
Time dummies	yes	yes	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes	yes	yes
Sector trend	yes	yes	yes	yes	yes	yes
Individual effects	no	no	no	yes	yes	yes
Observations	50977	50977	41777	50977	50977	41777
Number of sect.	62	62	62	62	62	62
R-squared	0.18	0.33	0.08	0.07	0.20	0.04
Number of indiv.	15436	15436	13952	15436	15436	13952

Absolute value of t statistics in parentheses

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

Table 10: Deregulation of the banking sector 1994, robustness checks

	(1)	(2)	(3)	(4)
	Fin. and services sec.	ln Tot.Comp.	Rents	Stayers
Market return	0.0071***	4.64e-6***	0.0070***	0.0069***
	(4.42)	(20.02)	(11.68)	(11.55)
Market ret. squd.	1.5e-10**	5.7e-15	4.4e-11**	5.1e-11***
	(2.57)	(0.72)	(2.39)	(2.89)
fin94	-505.3621***	-0.1083**	-508.0139***	-530.6380***
	(3.50)	(2.15)	(4.52)	(4.74)
fin94Xmktret	0.0018***	1.95e-7**	0.0022***	0.0022***
	(6.50)	(2.54)	(10.21)	(10.20)
Variance*market ret.	-0.0064***	-0.0000***	-0.0065***	-0.0064***
	(3.72)	(18.80)	(10.41)	(10.19)
Variance market	643.4061	0.1743*	510.5187**	
	(1.31)	(1.68)	(2.22)	
ln assets	637.31***	0.2093***	349.27***	374.37***
	(9.51)	(15.94)	(11.92)	(11.66)
ceo	287.72***	0.1293***	136.31***	124.44***
	(3.08)	(7.37)	(3.48)	(3.13)
Rents			-0.0580	
			(0.02)	
Rents*market ret.			0.0004	
			(1.37)	
Constant	-340,736***	-251***	-144,791	-329,757***
	(3.88)	(3.23)	(0.84)	(24.57)
Time dummies	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes
Sector trend	yes	yes	yes	yes
Individual effects	yes	yes	yes	yes
Observations	9247	39445	39418	39484
Number of indiv	3474	14147	14154	
R-squared	0.15	0.17	0.09	0.08
Number of stayers				14449

Absolute value of t statistics in parentheses

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

Notes: The reference estimation is column 4 of Table 8: (1) is computed on service industries (SIC 60 to 81) (2) has ln(tot.comp.) as dep. variable (3) includes rents in the specification (4) is computed on workers within the same firm

Table 11: Deregulation of the financial sector 1999, market returns

	(1)	(2)	(3)	(4)	(5)	(6)
	Total comp.	Sal+bonus	Options gr.	Total comp.	Sal+bonus	Options gr.
Market return	0.0137***	0.0025***	0.0029***	0.0103***	0.0018***	0.0007
	(25.91)	(19.93)	(6.59)	(19.39)	(20.10)	(1.53)
Market ret. sq.	1.9e-11***	1.0e-12**	1.9e-11***	1.1e-11***	2.2e-12***	1.5e-11***
	(9.63)	(2.22)	(11.72)	(5.31)	(6.03)	(7.24)
fin	-793.2***	-175.5***	-326.2***	-635.4***	-147.8***	-237.5**
	(5.87)	(5.55)	(2.93)	(5.42)	(7.57)	(2.32)
finXmktret	0.0015***	0.0002***	0.0002**	0.0016***	0.0002***	0.0003***
	(12.76)	(8.35)	(2.06)	(14.11)	(10.39)	(2.83)
Var.*mark. ret.	-0.0136***	-0.0024***	-0.0029***	-0.0104***	-0.0018***	-0.0007
	(25.28)	(19.30)	(6.42)	(19.28)	(19.75)	(1.43)
Variance mark.	1,622.8***	44.8***	1,873.5***	-578.6	744.8***	-960.6**
	(25.22)	(2.98)	(34.51)	(1.05)	(8.13)	(2.02)
ln assets	342.9069***	195.0105***	110.8193***	1,100.0066***	74.4715***	584.2***
	(27.08)	(65.79)	(10.33)	(24.98)	(10.15)	(14.62)
ceo	1,529.1***	631.8***	980.5***	194.4***	268.3***	316.4***
	(48.07)	(84.86)	(38.41)	(2.89)	(23.94)	(5.65)
Male	259.6527***	73.3866***	25.8249			
	(4.69)	(5.67)	(0.53)			
Constant	-497,822***	-110,447***	-321,563***	-62,499	-45,489	-176,154
	(19.54)	(18.52)	(15.28)	(0.07)	(0.32)	(0.29)
Time dummies	yes	yes	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes	yes	yes
Sector trend	yes	yes	yes	yes	yes	yes
Individual eff.	no	no	no	yes	yes	yes
Observations	41486	41486	36662	41486	41486	36662
Number of sic2	62	62	62	62	62	62
R-squared	0.21	0.33	0.16	0.11	0.17	0.06
Number of indiv.	14943	14943	14898	14943	14943	14898

Absolute value of t statistics in parentheses

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

Table 12: Deregulation of the financial sector 1999, accounting profits

	(1)	(2)	(3)	(4)	(5)	(6)
	Total comp.	Sal+bonus	Options gr.	Total comp.	Sal+bonus	Options gr.
Acc. profits	1.1834***	0.4525***	-0.9696***	5.4825***	1.367***	1.0060**
	(5.67)	(9.36)	(5.38)	(12.48)	(18.99)	(2.45)
Acc. profits sq.	-0.00001***	-3.9e-6***	-2.3e-6*	1.3e-6	-1.6e-6***	7.2e-6***
	(6.70)	(11.26)	(1.66)	(0.76)	(5.53)	(4.05)
fin	-53.3	-96.9***	-212.1*	-123.8	-47.21***	-164.2
	(0.41)	(3.19)	(1.91)	(1.09)	(2.53)	(1.63)
finXpre	0.4277***	0.1888***	0.1313***	0.4839***	0.07***	0.1317***
	(9.97)	(18.99)	(3.73)	(11.02)	(10.17)	(3.19)
Variance prof.	1,089.1***	133.2***	1,170.5***	-1,038.9**	-473.3***	-1,671.8***
	(15.88)	(8.38)	(19.29)	(2.55)	(7.09)	(4.63)
Var. pr*acc.pr.	-0.6677***	-0.3087***	1.1542***	-5.3795***	-1.299**	-1.0225**
	(3.13)	(6.24)	(6.25)	(11.70)	(17.24)	(2.37)
ln assets	263.0***	131.8***	172.2***	906.3***	34.51***	598.6***
	(17.37)	(37.54)	(12.72)	(24.56)	(5.7)	(16.89)
ceo	1,519.7***	627.1***	991.0***	197.1***	252.5***	390.5***
	(48.61)	(86.50)	(38.33)	(3.15)	(24.63)	(7.28)
Male	253.1560***	75.8750***	10.3479			
	(4.77)	(6.17)	(0.21)			
Constant	-373,684***	-73,268***	-341,964***	-423,541	-195,686	45,479
	(15.27)	(12.91)	(16.40)	(0.50)	(1.40)	(0.04)
Time dummies	yes	yes	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes	yes	yes
Sector trend	yes	yes	yes	yes	yes	yes
Individual eff.	no	no	no	yes	yes	yes
Observations	44167	44167	38746	44167	38746	38746
Number of sic2	62	62	62	62	62	62
R-squared	0.20	0.34	0.14	0.11	0.17	0.06
Number of ind.	15480	15432	15432	15480	15480	15432

Absolute value of t statistics in parentheses

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

Table 13: Deregulation of the financial sector 1999, robustness checks

	(1)	(2)	(3)	(4)
	Fin. and services sec.	ln Tot.Comp.	Rents	Stayers
Market return	0.0117***	4.64e-6***	0.0102***	0.0105***
	(10.64)	(27.28)	(19.09)	(19.77)
Market ret. squd.	2.7e-11***	3.7e-16	1.2e-11***	1.1e-11***
	(8.10)	(0.53)	(5.53)	(5.12)
fin	-674.0828***	-0.2743***	-638.7240***	-616.1032***
	(4.05)	(7.31)	(5.42)	(5.28)
finXmktret	0.0017***	1.95e-7***	0.0016***	0.0016***
	(13.42)	(5.27)	(14.07)	(14.07)
Variance*market ret.	-0.0120***	-0.0000***	-0.0103***	-0.0106***
	(10.84)	(26.90)	(18.91)	(19.66)
Variance market	704.8854	-0.2098	-581.6126	
	(0.49)	(1.15)	(1.06)	
ln assets	1,027.3077***	0.4299***	1,114.5571***	1,216.1255***
	(12.50)	(30.41)	(24.91)	(25.88)
ceo	139.5992	0.1673***	194.4852***	130.9413*
	(1.01)	(7.74)	(2.88)	(1.90)
Rents			11.0591**	
			(2.11)	
Rents*market ret.			-0.0001	
			(1.53)	
Constant	-2,093,703.1***	-99.0	-65,368.8	-724,942.3***
	(8.90)	(0.36)	(0.08)	(30.08)
Time dummies	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes
Sector trend	yes	yes	yes	yes
Individual effects	yes	yes	yes	yes
Observations	11092	41403	41425	41486
Number of individuals	4127	14925	14933	
R-squared	0.13	0.19	0.11	0.11
Number of stayers				15280

Absolute value of t statistics in parentheses

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

Notes: The reference estimation is column 4 of Table 11: (1) is computed on service industries (SIC 60 to 81) (2) has ln(tot.comp.) as dep.variable (3) includes rents in the specification (4) is computed on workers within the same firm

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The Centre for Economic Performance Publications Unit
Tel 020 7955 7673 Fax 020 7955 7595 Email info@cep.lse.ac.uk
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