ISSN 2042-2695

CENTRE *for* ECONOMIC PERFORMANCE

CEP Discussion Paper No 1088

November 2011
(Paper revised May 2012)

Firm Performance and Wages: Evidence from Across the Corporate Hierarchy

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E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Abstract
Does it matter whether you work for a successful company? And if so, does it matter who you are? To answer these questions we construct a unique panel dataset covering the pay of all CEOs, senior managers and a fully representative sample of workers for a large group of publicly-listed companies covering just under 90% of the market capitalization of the UK stock market. We show that senior management appear to have pay that is strongly associated with various measures of firm performance (such as shareholder returns and quasi-rents), while workers' pay is only weakly associated with such measures. A 10% increase in firm value is associated with an increase of 3% in CEO pay but only 0.2% in average workers' pay. Falls in firm performance are also followed by CEO pay cuts and significantly more CEO firings. This is essentially a result of the responsiveness of flexible pay to performance and only senior executives have a large enough share of pay in bonuses to generate a sizeable overall effect on pay. External control matters for pay - firms with lower levels of institutional ownership have smaller pay-performance elasticities for CEOs and do not cut their pay when performance is poor.

This paper was produced as part of the Centre's Productivity and Innovation Programme. The Centre for Economic Performance is financed by the Economic and Social Research Council.

Acknowledgements
We are grateful to Richard Belfield and participants in seminars at Towers Watson, ECB, LSE, Oxford, Sheffield and the RES Conference for helpful comments. We thank Towers Watson for providing some of the data, although the views expressed are those of the authors and not Towers Watson. We have not accepted research funds from Towers Watson. This work was based on data from the Annual Survey of Hours and Earnings, produced by the Office for National Statistics (ONS) and supplied by the Secure Data Service at the UK Data Archive. The data are Crown Copyright and reproduced with the permission of the controller of HMSO and Queen's Printer for Scotland. The use of the data in this work does not imply the endorsement of ONS or the Secure Data Service at the UK Data Archive in relation to the interpretation or analysis of the data. This work uses research datasets which may not exactly reproduce National Statistics aggregates. This research was funded by the ESRC at the Centre for Economic Performance.

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Published by
Centre for Economic Performance
London School of Economics and Political Science
Houghton Street
London WC2A 2AE

I. INTRODUCTION

In the wake of the financial crisis the pay of CEOs is high on the agenda of policymakers all over the world. Two linked factors seem to be responsible for this. First, the pay of CEOs and other senior executives has risen much faster than that of ordinary workers. Second, there is growing concern that this pay is unrelated to the actual contribution of the CEO to the business they run. Corporate scandals from Enron to Worldcom to Merrill Lynch seem to suggest that executives are more concerned with extracting value from the business than improving the long-run performance of the firm. At the same time worker's wages are hardly rising in real terms and they seem to benefit from none of the "performance" used to justify CEO pay.

That CEO pay has risen substantially relative to workers over the last few decades is beyond dispute. An oft-quoted number is the ratio of CEO pay to the pay of an ordinary worker. Indeed this ratio acquired legislative recognition in the Dodd-Frank Act. The size of this ratio has unambiguously been rising in both the UK and US. For the US, Bertrand (2009) shows that the median corporate executive officer earned 110 times the average workers earnings in 2005, compared with less than 30 times in the early 1970s. More dramatic still, Conyon et al (2010) find that for S&P500 CEOs, the average CEO made 31 times the wage of the average production worker in 1970 (26 times for the median CEO) but this ratio was 325 by 2008 (240 times for the median). Less consistent figures exist for the UK. However, Conyon, Gregg and Machin (1995) show that the median pay of the highest paid directors in FTSE-100 companies was £63,000 in 1980[1], compared to median wages of £5,400. By 2010, the median pay of this set of directors was £2.99m, while median wages had risen to £25,900. Thus the ratio went from 11 to 116[2]. This rise in CEO pay has been mirrored in a substantial rise in the share of income going to the very top earners – only a small minority of whom are CEOs (see Atkinson, Piketty and Saez (2011) and Kaplan and Rauh (2010)).

[1] This covers only salary and bonus. However in 1980 very few UK firms had equity-linked remuneration.

[2] Of course this ratio is focused on CEOs of FTSE 100 companies rather than the broader cross-section of listed firms. Such CEOs tend to earn substantially more than the average. For the sample that we use in this paper (the largest 300 firms each year), the median pay of CEOs in 2010 was £1.32m, producing a median pay ratio of 51 (and a mean pay ratio of 60).

But is it true that pay does not respond to firm performance – and exactly who's pay responds? There is in fact pervasive evidence across many countries that the pay of CEOs is correlated with measures of corporate performance (e.g. Bertrand, 2009).[3] This is most commonly measured using shareholder returns (the so-called "pay-performance elasticity") but is also observed using accounting measures of performance such as profitability and sales growth. But what about more junior managers and ordinary workers? Do they reap some of the rewards of improved corporate performance? Surprisingly little is known about the responsiveness of wages outside the Boardroom to shareholder returns. Bronars and Famulari (2001) provide some evidence that white-collar workers have pay-performance elasticities of perhaps two-thirds the size of CEOs, but this is from a reasonably small sample and is cross-sectional.

There is a more extensive empirical literature on the importance of "rent-sharing" for average worker wages. In general, the evidence seems to suggest that workers are paid more in firms that are more profitable. However the majority of this evidence relates to manufacturing in the 1970s and 1980s and is rarely able to control for match quality between workers and firms. There remains a concern that much of the observed relationship is simply a result of more profitable firms employing better quality workers[4].

In this paper we explore the responsiveness of wages across the corporate hierarchy to firm performance. We are able to link the pay of CEOs, senior executives and a large sample of workers for over 400 large publicly-listed companies in the UK over the period 2001-2010. This sample of companies accounts for just under 90% of the market capitalization of all UK-domiciled companies. For a sub-sample of firms we have access to a confidential annual remuneration survey conducted by a leading executive compensation consultancy that provides very detailed data on pay for the top layers of management within the firm. Thus we are able to identify a large group

[3] This does not rule out the possibility that CEOs are also, and perhaps substantially, rewarded for luck (Bertrand and Mullainathan, 2001). Nor does it imply that the pay-performance elasticity is optimal.
[4] For example, in Nickell, Vainiomaki and Wadhwani (1994) the coefficient on firm performance in a panel wage regression using just the average wage in the firm drops by two-thirds when the panel is re-run using the average wage of a group of workers of the same skill level.

of executives whose pay is not reported in annual remuneration reports but who are very senior within the company.

To motivate our work we first replicate the classic rent-sharing study of Blanchflower, Oswald and Sanfey (1996). They used an unbalanced panel from US manufacturing over the period 1964-85 to show that a rise in a sector's profitability was followed by an increase in the level of wages. They control for worker characteristics such as education and experience by matching the CPS at the industry level and including industry fixed effects. The estimated long-run elasticity between pay and performance is 0.068[5]. Following the same procedures as Blanchflower et al (1996) we put together data between 1964-2005 that allows us to split the sample period into 1964-85 (their estimation period) and 1986-2005[6].

In Table A1 we report estimates for annual log earnings regressions. Column 1 reports the estimates from Table IV of Blanchflower et al (1996), Column 2 reports the same specification over the first half of the sample and column 3 estimates the same model over the latter half of the sample. Although our replication in column 2 finds broadly similar and significant rent-sharing effects as Blanchflower et al (1996) over the 1964-1985 period, there are no such effects over the later period 1986-2005. This suggests, for the average worker the "rent sharing" parameter has essentially disappeared. We also estimated the model using data on hourly log earnings for production workers from the NBER Productivity Database.[7] The long-run elasticity for the first half of the sample (0.054) is remarkably close to the estimate in column 1, but again, any rent-sharing seems to have vanished since then, with a long-run elasticity of precisely zero.

These findings suggest that rent-sharing may be a thing of the past. When unions were stronger or markets in manufacturing less competitive, workers may have been able to

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[5] This is calculated from the estimated semi-elasticity and the mean of profits per head.

[6] Data on wages, hours and worker characteristics come from the CPS March Annual Demographic file and profits per worker come from the NBER productivity database.

[7] This has the advantage of allowing us to identify 459 consistent 4-digit industries rather than the 16 2-digit industries. The disadvantage is that we cannot control for worker characteristics that change over time across industries. The last three columns of Table A1 report the results for this alternative and show similar results to the first three columns (although the wider industrial cross-section improves the precision). Unemployment is these regressions is measured at the 2-digit industry level.

share in the rents from firms. But maybe this is no longer true today? In fact, we will show that rent sharing appears alive and well – at least for employees high enough up the corporate hierarchy. We find that the pay of CEOs and senior executives within the firm are strongly correlated with corporate performance measures – both shareholder returns and quasi-rents. Lower-level managers (essentially white-collar non-executives) have a positive pay-performance elasticity but only around one-fifth of the magnitude for senior executives. In contrast, ordinary workers have pay that appears relatively unresponsive to firm performance.

We then show that these results are easily understood by examining the responsiveness of individual pay components to performance. For all levels of worker, salary is not strongly related to performance while bonuses, and to a lesser extent other forms of incentive pay, are very strongly related. This is true for ordinary workers as well as CEOs, though the elasticity is larger in the latter case. But since bonuses account for a small share of total pay for lower-level workers, the overall effect is negligible. For CEOs and senior executives, bonuses are a large share of pay, so the overall pay-performance elasticity is large and significant. Finally, we show that the link between pay and performance is stronger and more symmetric in those firms that have higher levels of institutional ownership – external control matters for pay determination, at least at the top.

The paper is structured as follows. In the next section we briefly discuss the related theoretical and empirical literature on the links between firm performance and wages. In Section III we provide details of the various datasets used in the paper and present some summary statistics on pay across the corporate hierarchy. Our results are presented in Section IV and we conclude in Section V.

II. THEORETICAL CONSIDERATIONS AND EXISTING EMPIRICAL EVIDENCE

The standard competitive model predicts that long-run wages should depend on worker's skills, both observed and unobserved, but not on the performance of the firm[8]. However in more realistic settings, we might expect to observe a positive correlation between wages and firm performance – e.g. standard bargaining models predict such a link. Another example is the recent work on firm heterogeneity, trade and wages, in which more productive firms screen more intensively, hire more able workers and pay higher wages. The differences in firm characteristics are systematically related to export performance, as exporters are larger and more productive (e.g. Helpman, Itskhoki and Redding, 2010).

To be more concrete, consider two models of wage determination that generate links between firm performance and wages. First, suppose we have a model in which wages are determined by a Nash problem, with θ measuring the bargaining power of employees. This has traditionally been associated with union-bargaining. Note that θ can vary across employees so that some employees e.g. senior managers may have more bargaining power. The maximisation problem is simply:

$$\max \theta log\{[u(w) - u(\bar{w})]n\} + (1-\theta) log\pi$$

where *u(w)* is the worker's utility from wage *w*, $\bar{w}$ is the outside wage in the event of a breakdown in bargaining, *n* is employment and π is profits. Profits are zero if bargaining breaks down. It is easily shown that at an interior optimum, the first-order conditions imply that:

$$w \;\cong\; \bar{w} + \left(\frac{\theta}{1-\theta}\right)\frac{\pi}{n}$$

The equilibrium wage is determined by the outside wage, the relative bargaining strength of the two sides and the level of profits-per-worker.

As an alternative, the standard agency model has risk-neutral shareholders trying to induce risk-averse employees (typically senior executives) to maximise shareholder value. With imperfect observability, shareholders cannot contract on actions. Thus they offer a contract that makes pay dependent on the firm's performance. Let *p* denote firm performance and *a* the employee's actions. Firm performance depends on

[8] Firm characteristics should only matter if they affect compensating differentials for workers (e.g. Rosen, 1986).

the actions of the employee and on random factors, *u*. Holmstrom and Milgrom (1987) derive the optimal incentive scheme, *w*, for this model. Since shareholders can only observe *p*, this is all the incentive scheme can depend on. So,

$$w = \alpha + \beta p$$

If we assume that the worker has exponential utility, $U(p) = exp[r(Wc(e)]$, where r is absolute risk aversion and *c(e)* is the convex disutility of effort, the optimal sharing rate is simply (see Murphy (1999)):

$$\beta = \frac{1}{1 + r\sigma^2 c''}$$

From our perspective, the important implications of this sharing rule are that β is declining for more risk-averse workers ($\partial\beta/\partial r < 0$) and where there is more noise in the relationship between worker effort and firm performance($\partial\beta/\partial\sigma^2 < 0$). Both of these effects seem likely to be more important for more junior employees. Thus we expect β to be larger for CEOs than more junior workers.

There is an extensive empirical literature showing that firm characteristics matter for wages. For example, Abowd, Kramarz and Margolis (1999) show that while worker-"quality" is most important in explaining overall individual wage variation, firm-specific effects are also significant and the two are not highly correlated. What are these firm-specific effects? There is evidence that part of the effect is related to the profitability of the firm. Firms that have more profits appear to pay higher wages than otherwise identical firms. Manning (2011) reviews this literature. There are two key difficulties with this body of evidence. First, most studies use data on the average wage in a firm, so the panel is at the firm-level rather than the individual-level. This then raises the concern that more profitable firms hire more-able workers and that the positive correlation is capturing this effect. Firm fixed-effects mitigate this problem but do not solve it since the average unobserved worker quality may vary over time within a firm. Second, profits are potentially endogenous. Suppose, for example, that efficiency wages are important so that firms who pay workers more experience a rise in profits. It has generally proved difficult to identify a strong instrument that also satisfies the exclusion restrictions.

In a recent contribution to this literature, Card, Devicienti and Maida (2010) examine the prevalence of rent-sharing in a large panel of individual workers employed in a region of Italy. Pooled OLS estimates that control for worker and firm characteristics but not worker-firm match quality generate wage-rent elasticities of the order of 0.07. Controlling for the worker-firm match reduces this estimate to 0.008. Finally, instrumenting the rents measure using rents in the same 4-digit industry in other parts of Italy generates an elasticity of 0.029. These results point to three important conclusions. First, worker-firm matches matter enormously and ignoring them potentially generates a large upward bias in the rent-sharing estimate. Second, instrumenting rents also seems to matter and ignoring this generates a downward bias in the rent-sharing estimate.[9] Third, the magnitude of the pay-performance link for ordinary workers does not seem to be that large – since moving from the least to the most profitable firm generates no more than a 10% increase in wages.

Since the seminal work of Jensen and Murphy (1990), there have been hundreds of estimates of the link between CEO pay and firm performance. The key performance metric used tends to be shareholder returns since this is the obvious objective in a principal-agent model with shareholders as the principals. The extensive literature has recently been reviewed by Frydman and Jenter (2010). The overall conclusion is that there is a positive, statistically significant relationship between CEO pay and shareholder returns. This link exists for most time periods and across most countries, and there appears to have been an increase in the sensitivity of pay to performance in more recent times' as CEO compensation has tilted toward a more incentive-based structure (see Hall and Liebman (1998)). However, the interpretation of a positive pay-performance link for CEOs remains a more open question. It may be the outcome of an optimal contract between principal and agent or it could reflect the exercise of managerial power in an executive rent-sharing setting.

[9] It should also be noted that Card et al find that the wage-rents elasticity is much larger in manufacturing firms than in non-manufacturing. Indeed even after instrumenting, the coefficient is not significantly different from zero for non-manufacturing. This is important since most of the prior empirical literature focused exclusively on manufacturing firms.

There is very little work examining the link between shareholder returns and the pay of either executives below the Boardroom or ordinary workers. This is principally a result of the lack of data on individual wages in publicly-listed companies. While the pay of the five most senior executives is recorded annually in the remuneration report, no other wage data is revealed (other than the total firm wage bill). Standard US wage data sources such as the Current Population Survey do not easily link to firm-level identifiers that would allow for the wage-shareholder return relationship to be estimated. Bronars and Famulari (2001) provide some evidence from a specially conducted survey of the Bureau of Labor Statistics. This survey collected data on the pay of white-collar workers that was then linked to firm identifiers. This produced a small sample of 807 workers who worked for 92 different publicly listed companies. They find that equity returns in the firm three to six years prior are positively correlated with individual wages, controlling for individual characteristics. The size of the effect for white-collar workers is roughly one-third smaller than that of the matched CEO pay-performance elasticity. Unfortunately, the analysis is cross sectional so the result could be due to unobserved worker or firm fixed effects.[10]

III. DATA

IIIA. Remuneration Data

Our main data on pay comes from three sources: Boardex, Towers Watson (TW) and ASHE (Annual Survey of Hours and Earnings). The Boardex database provides annual data from the Remuneration report of all listed-UK companies. This database is essentially the UK version of US ExecuComp. The data cover up to the five highest-paid executives within the firm and report base salary, cash bonuses, stock options (valued via the Black-Scholes formula) and the face value of all Long-Term Incentive Plan (LTIP) awards. These awards can take the form of options, restricted and performance-related shares, matching plans, deferred cash etc. We measure total expected compensation as the sum of all these components. We separately identify the CEO and the remaining subordinate executives. Our sample is the 300 largest and publicly listed UK-domiciled firms each year from 2000-2010, representing on average 94% of the market capitalization of the UK stock market. This gives a total

[10] For a small sub-sample, the authors have data on the starting wage of the worker's, which allows them to condition on this to attempt to control for worker-firm match quality. This is unlikely to be satisfactory in any model in which firms and workers learn about the match-quality over time. Their results are the same as in the cross-section.

sample of 498 firms. We then match these 498 firms to the Boardex database and obtain 439 matches with pay data, representing around 85% of total market capitalization.[11] We have a final Boardex sample of 900 CEOs and 2,342 non-CEO executives.

Second, we have access to a proprietary remuneration survey conducted annually by Towers Watson, one of the world's leading human resources consultants. TW survey a sample of large UK companies. The survey covers between 100-150 firms each year over the period 2001-2010. There are two key advantages of the TW data over the published Boardex data. First, the TW survey provides us with extensive data on the pay of senior executives below the Board level. Reporting lines within the firm are used to generate management levels depending on the distance between the executive and the CEO. So "Level 1" are CEOs, "Level 2" are executives reporting directly to the CEO, and so on. Firms choose how many levels down to report and the percentage of executives within a level to report. Discussions with TW confirm that coverage of Levels 1 and 2 within a firm is almost complete and Level 3 is also well represented. We combine all executives at Level 3 and below into one level since their average annual remuneration are broadly similar. For the sample used for which we have at least two years of data, we have 163 CEOs, 918 Level 2 executives, and 2,193 Level 3 and below executives.

The second advantage of the TW data is that the valuation of all the components of pay is performed consistently by analysts at TW. Crucially, firms provide information on the exact structure of the LTIP share awards (e.g. comparator measure, comparator group, vesting triggers and percentages etc.) which allows for the construction of an ex ante valuation of these important components of pay. To our knowledge this is the first paper that has been able to use expected values for these types of awards. On average, the TW sample places a 40% ex-ante valuation on the face value of such LTIP awards (which is what we use in the Boardex sample where we do not know the details of LTIPs).

[11] We fully match every firm to a Boardex identifier. The 59 firms without pay data are generally those that delisted at some point in 2001 or 2002 and appear not to have had their remuneration reports entered or archived by Boardex – see Data Appendix for more details.

Finally, our sample of workers' wages comes from ASHE. This is a sample of 1% of all employees in the UK based on the final two-digits of an individual's national insurance number (the same as a US Social Security number). As a consequence of this sampling frame, the data provide a panel of workers over time. The survey is conducted in the first week of April in each year and data is provided by employers. Compliance is a legal requirement and the data is very accurate. The data we use run from 2002-2009 and cover annual pay, including all cash-based forms of incentive and bonus pay. Importantly, from 2002 ASHE started to distinguish between base salary and bonuses, so we can decompose the effects of firm performance on these two types of remuneration (see also Bell and Van Reenen, 2010). There is no data on share-based incentive plans but this is unlikely to be a serious omission as ordinary UK workers have virtually none of their pay in shares.

III.B Company Data

Our various sources on wages are all matched together using firm-level identifiers (further explanation of the matching process is contained in the Data Appendix). Our final core sample contains 439 companies that have data from Boardex on the pay of CEOs and Level 2 executives. Of these 439 companies, we are able to match to 376 in ASHE and therefore have data on the pay of other workers in the same firm. This gives us a sample of 5,108 managers and 23,738 workers who are below the executive level. Finally, we have a subset of 126 firms for which we also have data from TW on the pay of a broader range of executives.

For all these firms we also have annual company account data and stock price data merged in from Thompson Datastream. These relate to the worldwide consolidated activity of the firm and enable us to construct standard measures of firm performance such as shareholders' return, quasi-rents, profitability and revenues per worker. It is also possible to extract information from the confidential ARD, which are the confidential but mandatory reports to the UK equivalent of the Census Bureau (the ONS). We use this to construct other measures of performance based on the domestic activity of our firms.

IIIC Data Description

Table 1 reports some summary statistics for the wage data. We report the mean level of total pay for each type of worker and break this total into the component parts. The Towers Watson data shows that the average total package for CEOs over the sample period was £2.05m. Over the course of the decade, the average package rose from £1.38m in 2001 to £2.61m in 2009/10. Base salary accounts for 34% of remuneration, cash bonuses for another 31% and long-term incentive plans for the remaining 35%. As we move down the corporate hierarchy, the ratio of total pay from one level to the next drops significantly. So CEOs (Level 1) earn 207% more than the next rung on the ladder (Level 2), and they in turn earn 151% more than the next rung (Level 3).[12] In addition, the structure of pay changes as we move down the hierarchy. LTIPs account for 35% of CEO pay, but only 19% of those in Level 3+ jobs. In contrast, cash bonuses account for around 30% of total pay for all levels of management.

The Boardex data show broadly the same pattern as TW. The level of CEO pay is lower than in the TW sample (since the Boardex sample includes more mid-cap firms), with total expected pay of £1.26m. However the composition of pay is very close to that in the TW sample, with base salary accounting for 35% of remuneration, cash bonuses for another 25% and long-term incentive plans for the remaining 40%. Level 2 executives have higher pay than might be expected (since CEOs earn 79% more rather than the 209% observed in the TW data), but it should be recalled that the Level 2 executives reported in Boardex are up to the next four-highest paid executives rather than the full cross-section of executives reporting to the CEO. Again however the similarity with the TW sample in terms of level and composition is clear.

The data from ASHE show the large gaps that exist between pay at the top of a company and that of the average worker. For those workers not in managerial positions average annual pay is around £21,000, of which of only 5% is bonus pay[13]. This compares with average cash remuneration of £707,000 for the matched CEOs,

[12] These figures can be compared to those reported in Main et al (1993) who have similar data on US executives over the period 1980-4. They estimate a ratio of 141% for CEOs and 75% for the next rung. It should be noted that they only have cash remuneration data. If we recalculate using this measure, our equivalent ratios are 139% and 115%.

[13] The worker sample is restricted to those in the same job as 12 months ago earning at least £4,000 per year.

giving a pay ratio of 34. If instead we compare with total expected remuneration, this ratio rises to 57.

IV. MAIN RESULTS

In this section we report estimates of pay-performance elasticities across the corporate hierarchy, using both shareholder returns and quasi-rents as measures of performance. We also reconcile our results with the previous literature on both CEO and worker pay. Finally, we examine which components of pay are key to understanding the pay-performance links we observe.

IVA. Firm-Level Pay-Performance Regressions

We estimate standard panel regressions of the form:

$$ln(pay)_{ijt} = \alpha_{ij} + \sum_{k=0}^{K} \beta_k \mathrm{X}_{\mathrm{jt-k}} + \tau_t + \varepsilon_{ijt} \quad (1)$$

where $\ln(pay)_{\mathrm{ijt}}$ is the total remuneration of employee *i* at firm *j* at time *t*, α_{ij} is an individual worker-firm match fixed effect, τ_t are time dummies and X is the measure of firm performance – either shareholder returns or proxies for quasi-rents. We allow both for the contemporaneous effect of performance on pay and lagged effects (our baseline is *K*=2, but we also experimented with alternative dynamic forms). The model is estimated as a fixed-effect panel, with robust standards errors clustered at the firm level.

Table 2 contains estimates using total shareholder returns (TSR) as the measure of performance. These results are therefore identical to the standard pay-performance regressions in the CEO literature but now applied across the corporate hierarchy. We use our three different datasets and various corporate reporting levels.

The pay-performance elasticity for the CEOs in the Towers Watson sample is estimated at 0.248 in the short-run and 0.295 in the long-run, which is certainly on the high side of estimates for the UK.[14] The elasticity declines as we move down the corporate hierarchy with those in the next reporting level (Level 2) having an elasticity of 0.173, about two-thirds as big as CEOs, with a similar reduction as we move to the next level (0.121). However the effect is significant for all the executives in this sample. If we allow for a dynamic effect, the results are broadly similar, though the CEO elasticity now rises to 0.295 and those of the lower levels falls slightly.

Turning to the broader Boardex sample, we estimate TSR elasticities of around 0.2 for both CEOs and those in Level 2. Thus the broader group of senior executives shows very similar elasticities. These fall somewhat when we allow for lagged shareholder returns effects, but the overall elasticities remain sizeable and significant.

So we know that pay appears closely linked to TSR performance for most executives, with those at the top of the hierarchy having the most responsive pay. What about lower-level workers? Focusing on the ASHE sample in the lower panel of Table 2, we can see that there is a significant estimated elasticity of pay with respect to shareholder returns for non-managerial workers, but the magnitude of the coefficient is tiny: an order of magnitude smaller than that observed for senior executives. For managers there is a somewhat larger positive effect on pay – though still around five times smaller than that for CEOs.

Table 3 uses quasi-rents, the difference between sales per head and the average outside wage, as an alternative measure of firm performance. We assume here that the outside wage for all executives is captured by the aggregate time dummies (i.e. a common pool for talent), while for managers we control for the two-digit industry average wage and for workers both the two-digit industry and two-digit occupation average wage. We have also experimented with (i) adjusting sales for industry-level intermediate cost shares and (ii) using more disaggregated industries, but this has little effect on our estimates. This model is similar to that estimated by Card et al (2010), though they specify the rents variable in levels rather than logs and include capital per head.

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[14] Conyon et al (2011) have an estimate of 0.096 over the period 2003-08 and Ozkan (2009) reports an estimate of 0.093 over the period 1999-2005. However the sample in both papers covers much smaller companies on average than the TW sample. Indeed the summary statistics on pay levels in Ozkan are much closer to the Level 2 executives in the TW data.

Once again, we find a strong positive correlation between executive pay and firm performance. For both CEOs and the immediate level below, the elasticity is estimated to be around 0.2. The effect is roughly half the size for the lower level of executives. As with the TSR results, we find elasticities approximately one-tenth the size for workers and about one-fifth the size for managers.

Are the small pay-performance elasticity we observe for workers merely a result of focusing on a select group of large, quoted companies? To assess this, we estimate quasi-rent sharing models across all workers. The Annual Respondent Database (ARD) provides annual sales and employment data for every UK company, whether quoted or private. This data can be linked to ASHE for the period 2002-2008. Compared to our Boardex/ASHE sample, this increases the number of observations by a factor of five. It should be noted that the measurement of quasi-rents is not identical to that in Table 3. The ARD only measures sales and employment in the UK, while the sales and employment data used in Table 3 comes from the firm's annual accounts and therefore covers the firms' global totals. We might expect this difference to matter more for our quoted companies since they generally have extensive overseas operations.

The results of this exercise are shown in the first column of Appendix Table A2. For the full sample of workers, we estimate an elasticity of 0.007, which is actually smaller than that reported in Table 3. Interestingly this elasticity is almost identical to the OLS estimate for Italian workers using a very similar estimating model reported by Card et al (2010) who obtain an elasticity of 0.008 for value-added per worker. If we examine the rent-sharing elasticity for various sub-groups it is clear that the effect is much larger for very small companies and somewhat larger for manufacturing than non-manufacturing. This second result is also found by Card et al. Thus the small elasticity we find with respect to quasi-rents for workers appears a general phenomenon for all those working for medium and large-size companies, rather than a result of our particular sampling frame.

The final panel of Table A2 compares the results for our Boardex/ASHE sample of companies that have both global accounts measures of quasi-rents and UK-only measures from the ARD. The results show that there is no substantial difference between the two measures in terms of the estimated rent-sharing parameter[15].

Equation (1) assumes that pay is symmetric with respect to performance. This may not be a realistic assumption. For example, Bertrand and Mullainathan (2001) highlight the fact that large falls in the oil price do not seem to correlate well with declines in the pay of oil company CEOs, while oil price rises do seem to be associated with pay gains. So perhaps CEOs are rewarded for good outcomes (whether or not the outcome is due to their input) but not punished for bad outcomes. To explore this question in detail, we estimate (1) in first-differences and allow for a differential impact on pay growth from positive and negative shareholder returns. Table 4 reports the results of this exercise. The first column shows the pay elasticity for all returns, while the second column reports the additional pay elasticity associated with positive returns only. If CEOs were rewarded for good outcomes and not punished for bad outcomes, the first coefficient would be zero and the second positive. If instead, pay was symmetric with respect to performance, the first coefficient would be positive and the second zero. For both the TW and ASHE data, we cannot reject this second hypothesis. In contrast, the Boardex data does provide support for the idea that senior executives gain more from good outcomes than they lose from bad outcomes. But even then, we find no evidence to support the idea that CEOs are only exposed to the upside.

IV.B Firm Performance and Components of Pay

In Tables 5 and 6 we break total remuneration into three components: base salary, cash bonus and long-term incentive plans (LTIP). We then re-run equation (1) separately for each component of pay. Note that because both bonuses and incentive pay are zero for some workers we add £1 to the dependent variable to allow us to take logs (recall also that we only observe the first two components of pay in the ASHE data).

[15] It should be noted that the rent-sharing parameter is estimated to be 0.009 compared to 0.019 in Table 3. The key reason for this is that Table 3 includes data for 2009 while we only have ARD data up to 2008. If we re-estimate the model in Table 3 without 2009 data, the coefficient drops to 0.012. The remainder of the difference is caused by firms that do not have recorded sales or employment data in the ARD.

The results in Table 5 show that the pay-performance link is driven by the responsiveness of incentive pay to current shareholder returns. In the TW sample, there is a small positive effect on base salaries for CEOs, but the coefficient implies that a 10% increase in shareholder returns generates only a 0.3% increase in base salary. In contrast, the same increase in returns generates a 38% increase in the cash bonus. The responsiveness of bonuses to performance declines monotonically across the corporate hierarchy. The effect on LTIPs is substantially smaller. This is consistent with the view that firms set target incentive awards primarily as a multiple of base salary and do not explicitly allow current performance to influence the level of such awards. In contrast, cash bonuses are often explicitly justified in terms of contemporaneous performance. The results for the Boardex sample of executives are the same. Interestingly when we break the annual pay of managers and workers into base salary and cash bonus the same pattern we observed in the executives data occurs. Salary across both types of worker is unrelated to TSR, while bonuses are positively related for all workers. So workers bonuses rise by 7.5% for every 10% improvement in shareholder returns, and managers bonuses rise by 14%.

The results for quasi-rents given in Table 6 are broadly similar, though the results for the TW sample are all measured with considerable imprecision. But as with the TSR results, we find that rent-sharing occurs primarily through its effects on the incentive elements of pay. Indeed in both the Boardex and ASHE samples it is striking how strong the links are between quasi-rents and bonuses.

Why do we find no effect on workers' total pay from firm performance if we observe strong effects on bonuses? The simple answer is that workers do not receive a substantial fraction of their pay in bonuses. For the average worker, only 5% of pay is accounted for by bonuses. So a 10% rise in shareholder returns translates into only about a 0.4% rise in total pay. Appendix Tables A3 and A4 present similar regressions where the dependent variable is the proportion of total remuneration in bonus or incentive pay showing qualitatively similar results: increases in firm performance are associated with a significant increase of bonuses in total pay.

IV.C. Firm Performance and Job Exit

Our estimates implicitly assume that the executive or worker remains with the firm and so is in a position to have their pay respond to changes in firm performance. It is plausible however that poor performance may lead not only to lower wages but also to an increased probability of a job separation (e.g. Huson et al, 2001). Thus we may be underestimating the impact of firm performance. To examine this issue, we estimate job-exit probabilities for executives and workers. Since the TW sample varies from year to year it is difficult to identify the exact year of departure for any executive[16]. As a result we only present results for the Boardex data which covers all years and the ASHE data for workers. We define a job-exit as occurring subsequent to the last observed pay year for an individual with a particular firm, provided we observe the same firm in the following year but without the individual employed.

Table 7 reports the marginal probabilities of job-exit for CEO's, Level 2 executives and all other workers. The key independent variable is the change in shareholder returns. In addition, we include time dummies to control for macroeconomic conditions affecting job-separation rates. For senior executives we find strong negative effects from shareholder returns. In other words, poor firm performance is associated with an increased risk of job-exit. For workers, the effect is much small and no longer significant.

We also experimented with allowing for an asymmetry in the job-exit probability with respect to shareholder returns. However we found no significant difference between the impact of positive or negative returns on job-exits. This may be a result of the fact that our data cannot distinguish between voluntary and involuntary job-exits. Gregory-Smith et al (2009) show that for a broadly similar group of UK CEOs over the period 1996-2005, there is a strong effect on job-exits from shareholder returns. Furthermore, they conducted a news search of reasons for exit to identify exits due to dismissal. Unsurprisingly, the effect of poor shareholder returns is observed most strongly for those CEOs who are forced to leave. In contrast, exit for retirement is most common after good returns.

[16] The problem is that a firm may, for example, be in the TW data in 2001 and 2003 but not 2002. If the executive is in the 2001 survey but not the 2003 survey we cannot date the final pay year since we do not know whether he was still with the firm in 2002. The Boardex data does not have this attrition problem as we observe every consecutive year.

IV.D Institutional Ownership

There is an extensive literature on the impact of external shareholder control on both executive pay and firm performance. Numerous studies have argued that pay in the boardroom is related to measures of corporate governance such as the proportion of independent directors, the existence of a remuneration committee etc. Focusing on economic outcomes, Aghion, Van Reenen and Zingales (2009) find that higher institutional ownership in U.S. companies is associated with more innovation. Their suggested mechanism is that institutional investors reduce the career risk of risky projects.

Our data on institutional ownership comes from Thomson Reuters Global Ownership files. We are able to match all but 14 companies in the Boardex data. The data we use relates to December of each year from 1997 and records the percentage of outstanding shares owned by all those with a shareholding larger than 0.015%. For each shareholder, the data records the type of investor (e.g. individual, investment manager, hedge fund etc.), the geographic location of the investor and whether the investor is active or passive. In what follows, we simply calculate for each year the percentage of outstanding shares held by institutional investors. Across the sample as a whole, institutional investors account for 60% of share ownership – roughly the same as observed for the U.S. in the 2000s (Aghion et al, 2009). There is significant variation across companies, with a standard deviation of 19 percentage points. We split the sample into quartiles based on average institutional ownership and focus on the difference between the lowest quartile of ownership (less than 48%) and the other three quartiles.[17]

First, we examine whether the estimated pay-performance link differs depending on institutional ownership. Column (1) of Table 8 repeats the basic CEO fixed-effect TSR regression from Table 2 for the slightly reduced sample for which we also have institutional ownership data. The estimated coefficient is 0.243, which is reassuringly

[17] Nothing hangs on using quartiles or combining the highest three quartiles into one category. Results available on request show that the remaining three quartiles have very similar estimated coefficients and one cannot reject equality. When comparing the lowest quartile with the other category, there is no evidence of significant differences across observables such as sales, employment, market capitalisation or executive pay levels or growth rates.

similar to that reported earlier. In the second column, we include an additional interaction between TSR and a dummy for the lowest quartile of ownership.[18] This is significantly negative and we cannot reject at the 5% level that the overall pay-performance elasticity for low ownership firms is equal to zero. The pay-performance elasticity for the remaining three-quarters of firms rises to 0.325. So, firms with lower levels of institutional ownership do not seem to link pay and performance for their CEO.

In the remaining three columns of the Table we investigate whether the asymmetry we observed earlier is related to institutional ownership. We again estimate first-difference regressions allowing for a different pay-performance elasticity between positive and negative shareholder returns. Column (4) reproduces the results of Table 4 showing that there appears to be a marginal propensity to reward positive returns more favourably than negative returns are penalised. However when we allow for interactions with low institutional ownership, the differences are stark. Low ownership firms strongly reward positive returns with higher pay but require no pay penalty for negative returns. In contrast, the higher ownership firms appear to reward performance perfectly symmetrically.

IV.E Instrumental Variable estimates

The endogeneity of shareholder returns is rarely discussed in the CEO pay-performance literature. This is somewhat surprising since it seems reasonable to suppose that shocks to CEO pay can lead to contemporaneous changes in shareholder returns that would bias downward the rent-sharing parameter. Similarly, Abowd (1989) finds effects of shocks to bargained labour costs on the common stock value of firms. The problems of endogeneity have a longer history in the rent-sharing literature. In addition to exploiting the lag structure of the panels that Blanchflower et al (1996) focused on, potential external instruments have included firm-specific technological innovation (Van Reenen , 1996), import/export price shocks (Abowd and Lemieux , 1993, and Bertrand, 2004) and oil price shocks (Bertrand and Mullainathan, 2001). More recently, Card et al (2010) instruments the value-added per worker of each firm (their measure of rents) by the value-added per worker of all

[18] All regressions with institutional ownership effects also include a full-set of interactions between the ownership dummy and the time dummies and total employment.

firms in the same four-digit industry outside the region of Italy on which their analysis is conducted. The identifying assumption is that industry demand shocks affect firm-level profitability but have no direct effect on local labour supply[19].

We consider instrumenting firm-level shareholder returns with the returns in the global industry, but dropping the UK firms from this index to avoid a mechanical relationship (the Datastream Industrial Sub-Sector Global-ex-UK Index). For our 439 firms we have 93 such sub-sectors. For the quasi-rents measure we follow Card et al (2010) using and instrument firm-level quasi-rents by quasi-rents at the three-digit industry level in all other listed firms in the UK[20].

In Table 9A we begin by reporting the IV estimates for the shareholder return results. We repeat the OLS results from Table 2 in the first column, while the second column reports the IV results. The first-stage F-Statistics are reported in the third column (these are generally large suggesting that the instrument has power). In almost all cases the IV estimates are close to the OLS estimates and remain significantly positive. The only exception is for workers, where the IV estimate is lower than the OLS and insignificantly different from zero. At face value, the IV results imply that workers receive no benefit whatsoever from higher shareholder returns, while senior management continue to reap substantial rewards for performance.

Turning to the quasi-rent results in Table 9B, we note immediately that the instruments have generally less power than those for shareholder returns, particularly in the ASHE data. However, as with the TSR results, we again find sizeable rent-sharing elasticities for senior executives – with elasticities in the range of 0.3 to 0.5, though measured with considerable uncertainty. For junior managers we find larger

[19] Manning (2011) points out that what we are striving to identify is the effect of a change in rents in a single firm on wages in that firm. Using industry-level instruments may not identify this effect. If human capital has an industry-specific component, then a positive shock to industry profits would be expected to raise the demand for labour in a competitive market and hence raise the general level of wages. In an ideal world we would use firm-specific shocks to profits that are uncorrelated with firm-specific wages.

[20] We also experimented with using information on the energy-share of costs at the 3 and 4-digit level combined with energy price moves over the sample period. In no specification was such an instrument strong enough to provide convincing identification. In addition we considered instruments based on export/import shares interacted with movements in the effective exchange rate. Unfortunately over most of our sample period, sterling was quite stable against the currencies of major trading partners.

rent-sharing than was the case for shareholder returns. Finally, for workers the elasticity is estimated to be only around 0.025[21].

We also report IV estimates of the rent-sharing parameter for the full sample of all workers in Table A2. The advantage of exploiting the full sample is that we have many more workers across many companies which help to identify a more powerful first-stage regression. The results clearly suggest that the OLS estimates are biased downwards and for the overall sample the elasticity rises from 0.007 to 0.032. Interestingly this increase is almost identical to that reported by Card et al when moving from OLS to IV (their estimated elasticity rises from 0.008 to 0.029). It is also very close to the estimated worker elasticity in our Boardex/ASHE sub-sample of workers.

With the important caveat that we have no natural experiment to generate external instruments, the qualitative findings from Table 9A and 9B support our earlier overall conclusion from OLS. In all the exercises we have conducted, the elasticity of worker's pay with respect to either shareholder returns or quasi-rents is small and often insignificantly different from zero. In contrast, senior executives see substantial elasticities that are robust to alternative estimation strategies and, if anything, tend to be larger in IV estimates. Non-executive managers lay in between these extremes, with pay elasticities perhaps around one-fifth of the size of CEO elasticities.

IV.F The CEO-Worker Pay Gap over the Decade

Our results talk to the pay-performance link across firms and workers, but do not directly address the issue of relative pay growth over time. By construction, our empirical work abstracts from aggregate trends in pay growth across different workers by including time dummies in all specifications. But as we highlighted in the introduction, there has been a tremendous out-performance of CEO pay relative to workers over the course of the last decade. Average CEO pay across our full sample

[21] Note that the first stage F-statistic is weak for this specification (2.7). This is surprising as it is the same instrument that gives an F-statistics of 12-15 in the Boardex data. The reason is that we have many employees in firms where the instrument is not strong. If we keep only one worker from each firm/year that we match the F is 10.

rose from £911,000 to £1.92m.[22] Over the same period, the average wage of a full-time worker rose from £23,925 to £32,178. In other words, CEOs witnessed a 110% increase in their pay, while workers received only 35% more. So the ratio of CEO to worker pay rose from 38 to 60. But what of shareholder returns? The total return on the FTSE350 over the same period was 46.1% - mainly driven by dividends. If we assume that performance is measured as the real return and using a 0.3 pay-performance elasticity for CEOs (from the IV estimates), this would imply an average increase in relative pay over the period of 7.4% as a result of performance. So, we can account for only around one-tenth of the relative gain of CEO pay over the period as a result of shareholder return performance.

So what can account for the growth in CEO pay? We would make the following simple point. Wage inequality over the last decade has been driven by substantial gains in pay for those at the very extreme of the wage distribution (see Bell and Van Reenen, 2010). Whilst CEOs and other senior executives of publicly-listed companies are members of this extreme, they are not a substantial component. Suppose we focus on the top 1% of earners. In 2010, tax data show that the total earned income of taxpayers in the economy was £776bn[23]. The same tax data show that the top 1% of earners take around 13% of this total i.e. £101bn. In our data, the average CEO in 2010 received total pay of £1.92m. Thus for the top 300 firms who between them account for 94% of the total UK stock market, we get a total CEO pay bill of around £0.6bn. So even if we make generous assumptions regarding the pay of all the other senior executives on the Board of these firms, it is hard to see how we could surpass a total of more than £3bn[24]. So corporate executives perhaps account for around 3% of the top 1% of earners[25]. As we show in Bell and Van Reenen (2010), over 40% of

[22] The median increase for the CEO sample was from £617,000 to £1.32m

[23] This figure is derived from HMRC statistics. They report an estimated total income of all taxpayers in the UK for 2010 of £857bn. Using 2008 data, we know that 90.6% of total income is income from employment (or pensions deriving from previous employment) while the remained is investment income. Applying this percentage split to the 2010 data gives the figure of £776bn.

[24] In 2010, our data show that Level 2 executives received average total pay of £1.10m. If we assume that there are five non-CEO executive directors for each of the 300 companies, this adds an additional £1.65bn to the wage bill.

[25] Of course almost all the CEOs and a fraction of other senior executives are actually in the top 0.1% of the distribution. This group take around 5% of the total income share i.e. £39bn. But even amongst this group, corporate executives are still clearly a small minority.

workers in the top percentile are in the financial sector[26], while lawyers, accountants and management consultants are also all important contributors. This accounting point has been made for the U.S. by Kaplan and Rauh (2010). They calculate that non-financial corporate executives can account for no more than 4% of the top 0.1% of earners in the United States.

Trends in CEO pay over the last decade closely match trends in the pay of other highly-paid workers. In Figure 1, we plot the growth in CEO pay (obtained as the change in the estimated time dummies from the fixed-effect regressions in Table 2), together with the growth in pay of the top 1% and top 0.1% of workers from ASHE (having excluded all senior corporate executives from the data set). While the ASHE data is noisy for the top 0.1%, the similarity in trends is very clear. Indeed between 1999 and 2010, we estimate that overall CEO pay growth was essentially identical to that of non-executives in the top 0.1% of workers. So CEOs are a small fraction of the top earners in the UK and the trend in CEO pay has been the same as the trend in non-executive pay among top earners. Explanations for CEO pay growth are thus likely to be found in a more general account of pay evolutions at the top of the income distribution.

V. CONCLUSIONS

At the beginning of this paper we asked whether there was any advantage in working for a successful, profitable company. We are now in a position to answer that question. All the evidence we have examined suggests that senior executives reap the rewards of success while more junior managers and workers have wages that are much more weakly correlated with firm success. It matters not whether we measure this success by shareholder returns or quasi-rents – the results are consistent across the measures of firm performance.

[26] Another way of noting the relative importance of finance workers and corporate executives in the extreme of the income distribution is to examine the pay report of Barclays Bank for 2010. As part of enhanced disclosure requirements in the UK, Barclays revealed that their 231 most senior staff received total remuneration of £554m. This is the about the same total as we estimate for all the CEOs in our sample.

Looking at the separate components of pay allows us to understand the mechanism through which improved performance generates higher pay. Base salary tends to be unresponsive to firm performance, while cash bonuses are very responsive. Interestingly the bonus elasticity with respect to performance is strongly positive for all workers, though again larger in magnitude for the more senior members of the hierarchy. So workers do see the fruits of success in their bonus payments. But this effect is not large enough to feed through to a significant effect on total pay since the bonus share of pay is only 5%.

We also show that the responsiveness of pay to performance for senior executives depends in part on the level of institutional ownership in the firm. Those firms that have low institutional ownership do not have a significant link between pay and performance on average. However they appear to reward positive firm performance with wage rises while not penalising poor performance. In contrast, firms with higher levels of institutional ownership have a substantial stronger pay-performance link that appears perfectly symmetric. These findings complement a range of evidence that suggests that external shareholder control matters, at least where it is absent or low.

Why are senior executives treated differently than workers? This is an open question that our data cannot directly address. Two competing explanations are extant. First, senior executive's actions have substantial effects on the performance of their firm and shareholders wish to incentivize executives to take the right actions (e.g. Gabaix and Landier, 2008). Linking pay to performance helps achieve this objective and this is what we observe in the data. A second explanation is that executives exploit their managerial power to capture the rents that exist (e.g. Bebchuk and Fried, 2004).

Why do workers not enjoy the same rewards? It may be that this is the optimal result of an implicit insurance contract between workers and firms, with firms protecting workers from idiosyncratic shocks to the firm (see Guiso, Pistaferri and Schivardi (2005)). After all, performance can go down as well as up. Alternatively, it may be that an increasingly weakened workforce finds it harder to successfully bargain over rents. This latter explanation would be consistent with a declining value of the pay-performance elasticity over time.

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DATA APPENDIX

Sampling Frame

The sample of firms is constructed by ranking all UK-domiciled and UK primary-listed companies by market capitalisation at end-December every year from 2000 to 2009. We exclude investment trusts. The top 300 firms are selected and over the whole period this produces a sample of 498 firms. On average, the top 300 firms each year represent 94% of total market capitalization. These firms are then matched to share-price and annual accounts data in Datastream. We are able to match 486 of the firms.

The Boardex Sample

The 486 firms with share-price and accounts data are then matched to executive-level compensation data from Boardex. We have a flat-file from Boardex containing all executives of UK companies over the period 1999-2010. We are able to match all 486 firms, but only 439 have pay data in Boardex. Of the 47 companies with no pay data, 23 were delisted by the end of 2003. The Boardex coverage increased substantially at around this time and has subsequently covered almost all listed UK companies. Across all matched companies, we have 3,242 executives with at least two years of pay data.

The TW Sample

The Towers-Watson (TW) sample comes from the annual Executive Compensation Survey conducted by TW. The data cover up to five "layers" of management. Level 1 are CEOs and Executive Chairmen. Level 2 are all executives who have a direct reporting line to a Level 1 executive. Level 3 executives report directly to Level 2 executives and so on down the hierarchy. The pay data is substantially more detailed than normally provided. All the TW firms used are also in the larger Boardex sample.

To create a panel of executives we need to link job holders over cross-sections. The Survey asks for the initials of the job holder each year but these are not provided to us for confidentiality reasons. Instead a random number generator was used to create a 10-digit number that is unique for any set of worker initials. We match over adjacent cross-sections using this identifier, company name, year of hire and base salary (each survey asks for the prior year base salary of the individual as well as current base salary). In this way we create a panel of senior managers over time within a firm, allowing for promotions/demotions. However we cannot identify any workers who move from one firm to another in this sample.

The ASHE Sample

For each company in the Boardex sample, we have matched a DUNS number. The DUNS number is issued by Dun and Bradstreet and there can be multiple DUNS numbers within a single listed company. We use the number that matches the legally-listed entity. The ONS Annual Respondent Database (ARD) links DUNS numbers (called egrp_ref by ONS) to individual firms within the company (identified by the employer reference variable entref). There can be multiple entref's for a given egrp_ref. Of the 439 companies in the Boardex sample, we are able to link to 401 in the ARD.

From 2002 onward, the Annual Survey of Hours and Earnings contains an enterprise reference number (“entref”) for every worker. Thus we are able to link these to the associated DUNS number via the ARD. Of the 401 companies that have a Boardex-ARD match, we are able to link to 376 in ASHE.

FIGURE 1. ESTIMATED CEO PAY GROWTH

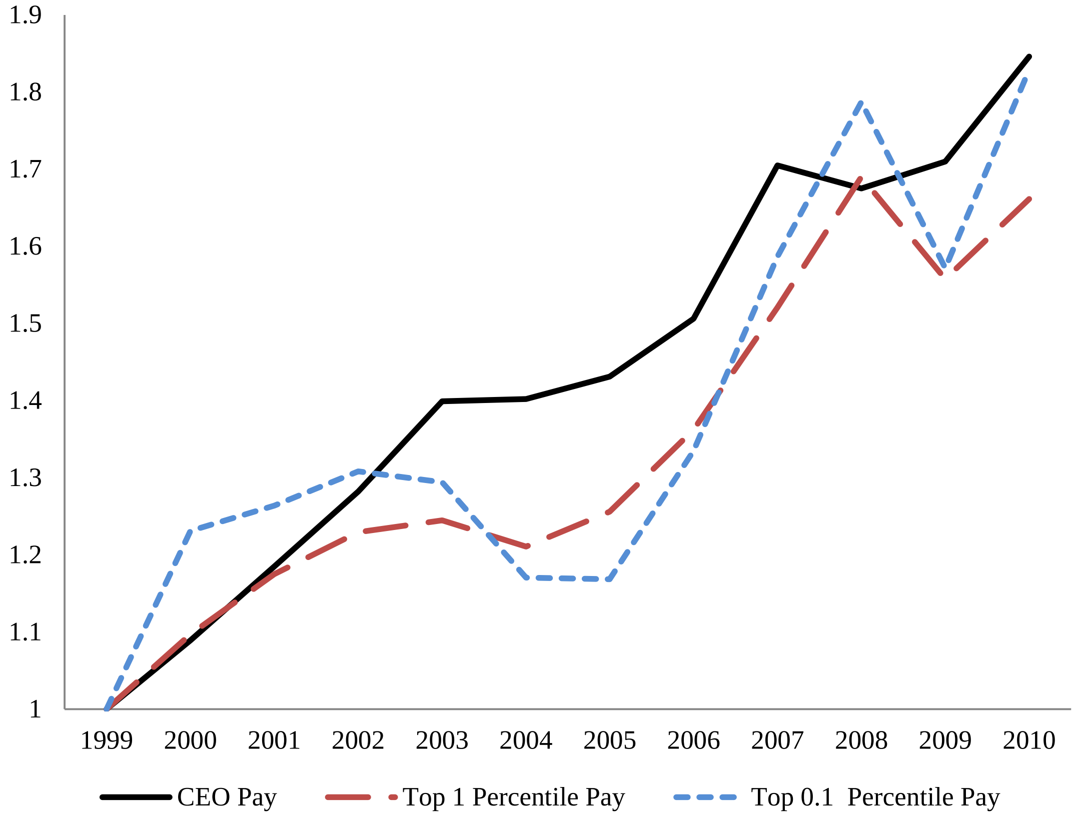

TABLE 1: SUMMARY STATISTICS

	Total Compensation	Salary	Bonus	LTIP
Towers Watson (TW) Sample				
CEO (n=624)	2,048	698	639	712
Level 2 (n=3,700)	668	282	189	197
Level 3 (n=8,889)	266	147	69	51
Boardex Sample				
CEO (n=4,295)	1,256	420	302	480
Level 2 (n=10,496)	702	253	177	237
ASHE Matched Sample				
Managers (n=21,193)	50	42	7	
Workers (n=96,319)	21	20	1	

Notes: All figures are in nominal £ thousands. Data are for 2001-2010 (TW), 2001-2010 (Boardex) and 2002-2009 (ASHE). LTIP=Long-Term Incentive Plans

TABLE 2: REMUNERATION AND TOTAL SHAREHOLDER RETURNS (TSR)

	Impact	Long-Run	#obs	#Workers	#Firms
Towers Watson Sample					
CEO	0.248** (0.055)	0.295** (0.061)	593	163	124
Level 2	0.173** (0.042)	0.151** (0.040)	3013	918	130
Level 3+	0.121** (0.026)	0.116** (0.033)	6551	2193	124
Boardex Sample					
CEO	0.222** (0.030)	0.152** (0.031)	4277	897	428
Level 2	0.208** (0.025)	0.138** (0.028)	10464	2338	433
ASHE Sample					
Managers	0.023** (0.006)	0.050** (0.008)	20445	5108	299
Workers	0.011** (0.004)	0.019** (0.009)	94650	23738	327

Notes: ** and * indicate significance at the 5% and 10% level respectively. Each row reports the results from a separate regression where the dependent variable is the ln(Total Expected Remuneration) of different types of employees from each of our three pay datasets (Towers Watson, Boardex and ASHE). In all specifications ln(TSR=Total Shareholder Return) is the measure of firm performance used and we report the OLS coefficient and standard error clustered by firm in parentheses underneath. The first column is the "impact" effect which includes only contemporaneously dated ln(TSR). Column 2 reports the long-run effect from a regression with both contemporaneous and two lags of ln(TSR). All regressions include worker-firm match fixed-effects, log employment and time dummies. ASHE worker regressions include two-digit industry ln(wages) and two digit occupation ln(wages) controls.

TABLE 3: REMUNERATION AND QUASI-RENTS PER EMPLOYEE

	Impact	Long-Run	#obs	#Workers	#Firms
Towers Watson Sample					
CEO	0.235** (0.104)	0.374** (0.129)	558	154	120
Level 2	0.168** (0.085)	0.219* (0.129)	2796	869	124
Level 3+	0.028 (0.037)	0.037 (0.073)	6137	2088	118
Boardex Sample					
CEO	0.203** (0.038)	0.189** (0.047)	4284	900	430
Level 2	0.240** (0.040)	0.231** (0.050)	10476	2342	435
ASHE Sample					
Managers	0.037** (0.018)	0.047* (0.026)	19455	4860	291
Workers	0.019 (0.012)	0.021 (0.017)	88132	22153	318

Notes: ** and * indicate significance at the 5% and 10% level respectively. Each row reports the results from a separate regression where the dependent variable is the ln(Total Expected Remuneration) of different types of employees from each of our three pay datasets (Towers Watson, Boardex and ASHE). In all specifications ln(QRN=Quasi-Rents per worker) is the measure of firm performance used and we report the OLS coefficient and standard error clustered by firm in parentheses underneath. The first column is the "impact" effect which includes only contemporaneously dated ln(QRN). Column 2 reports the long-run effect from a regression with both contemporaneous and two lags of ln(QRN). All regressions include worker-firm match fixed-effects, log employment and time dummies. ASHE worker regressions include two-digit industry ln(wages) and two digit occupation ln(wages) controls.

TABLE 4: ASYMMETRIES IN PAY-PERFORMANCE ELASTICITIES

	ΔTSR	ΔTSR(+)	#obs	#Workers	#Firms
Towers Watson Sample					
CEO	0.199**	-0.045	428	163	124
	(0.053)	(0.103)			
Level 2	0.158**	0.058	2048	918	129
	(0.047)	(0.082)			
Level 3+	0.093**	-0.004	4239	2193	123
	(0.029)	(0.064)			
Boardex Sample					
CEO	0.233**	0.132*	3356	870	424
	(0.043)	(0.073)			
Level 2	0.175**	0.263**	8085	2270	431
	(0.041)	(0.072)			
ASHE Sample					
Managers	0.041**	-0.031	14786	5108	295
	(0.016)	(0.028)			
Workers	0.016**	-0.007	66069	23738	325
	(0.005)	(0.008)			

Notes: ** and * indicate significance at the 5% and 10% level respectively. Each row reports the results from a separate first-difference regression where the dependent variable is the Δln(Total Expected Remuneration) of different types of employees from each of our three pay datasets (Towers Watson, Boardex and ASHE). In all specifications Δln(TSR=Total Shareholder Return) is the measure of firm performance used and an asymmetry is allowed for by including ΔlnTSR when positive as an additional regressor. We report the OLS coefficients and standard error clustered by firm in parentheses underneath. All regressions include the change in log employment and time dummies. ASHE worker regressions include two-digit industry ln(wages) and two digit occupation ln(wages) controls.

TABLE 5: DECOMPOSING THE EFFECT OF TOTAL SHAREHOLDER RETURN ON BASE SALARY, BONUS AND LTIP

	Base Salary	Bonus	LTIP
Towers Watson Sample			
CEO	0.026*	3.786**	0.682**
	(0.014)	(0.720)	(0.336)
Level 2	0.019	2.287**	0.991**
	(0.014)	(0.751)	(0.343)
Level 3+	0.010	1.497**	0.744*
	(0.007)	(0.485)	(0.397)
Boardex Sample			
CEO	0.010	1.036**	0.489**
	(0.015)	(0.089)	(0.102)
Level 2	-0.005	0.918**	0.574**
	(0.014)	(0.085)	(0.086)
ASHE Sample			
Managers	-0.012	1.368**	
	(0.014)	(0.620)	
Workers	-0.001	0.762**	
	(0.009)	(0.292)	

Notes: ** and * indicate significance at the 5% and 10% level respectively. Each cell reports the results from a separate regression where the dependent variable is the ln(Base Salary) in column 1, ln(1+Bonus) in column 2 and ln(1+LTIP) in column 3 where LTIP is the estimated value of the Long-Term Incentive Pay plan. Each row is based on different types of employees from each of our three pay datasets (Towers Watson, Boardex and ASHE). In all specifications ln(TSR=Total Shareholder Return) is the measure of firm performance used and we report the OLS coefficient and standard error clustered by firm in parentheses underneath. All regressions include worker-firm match fixed-effects, log employment and time dummies. ASHE worker regressions include two-digit industry ln(wages) and two digit occupation ln(wages) controls.

TABLE 6: DECOMPOSING THE EFFECT OF QUASI-RENTS ON BASE SALARY, BONUS AND LTIP

	Base Salary	Bonus	Incentive Plan
Towers Watson Sample			
CEO	0.117**	1.082	0.800
	(0.036)	(1.099)	(0.990)
Level 2	0.047	0.508	0.329
	(0.042)	(0.779)	(0.607)
Level 3	0.020	0.287	-0.070
	(0.017)	(0.622)	(0.606)
Boardex Sample			
CEO	0.097**	0.738**	0.194
	(0.024)	(0.165)	(0.183)
Level 2	0.111**	0.702**	0.538**
	(0.030)	(0.137)	(0.138)
ASHE Sample			
Managers	0.009	2.027**	
	(0.022)	(1.011)	
Workers	-0.004	1.707**	
	(0.013)	(0.524)	

Notes: ** and * indicate significance at the 5% and 10% level respectively. Each cell reports the results from a separate regression where the dependent variable is the ln(Base Salary) in column 1, ln(1+Bonus) in column 2 and ln(1+LTIP) in column 3 where LTIP is the estimated value of the Long-Term Incentive Pay plan. Each row is based on different types of employees from each of our three pay datasets (Towers Watson, Boardex and ASHE). In all specifications ln(QRN=Quasi-Rents per worker) is the measure of firm performance used and we report the OLS coefficient and standard error clustered by firm in parentheses underneath. All regressions include worker-firm match fixed-effects, log employment and time dummies. ASHE worker regressions include two-digit industry ln(wages) and two digit occupation ln(wages) controls.

TABLE 7: JOB-EXIT MARGINAL PROBABILITIES

	Boardex CEO	Boardex Level 2	ASHE Workers
ΔlnTSR	-0.071**	-0.052**	-0.029
	(0.012)	(0.009)	(0.020)
# obs	3155	9307	164725
# firms	419	420	372
# workers	845	2531	60339

Notes: ** and * indicate significance at the 1% and 5% level respectively. The coefficients are marginal effects from a probit model of job-exit with time dummies. Standard errors are clustered at the firm level.

TABLE 8: INSTITUTIONAL OWNERSHIP EFFECTS FOR CEOS

	(1)	(2)	(3)	(4)	(5)
*ln*TSR	0.243** (0.028)	0.325** (0.027)			
*ln*TSR * Low II		-0.244** (0.055)			
Δ*ln*TSR			0.308** (0.033)	0.251** (0.041)	0.343** (0.037)
Δ*ln*TSR(+)				0.140* (0.073)	0.046 (0.084)
Δ*ln*TSR * Low II					-0.282** (0.080)
Δ*ln*TSR(+) * Low II					0.279** (0.141)
FE/FD	FE	FE	FD	FD	FD
# obs	4251	4251	3338	3338	3338
# firms	426	426	423	423	423

Notes: ** and * indicate significance at the 5% and 10% level respectively. The first two columns are fixed-effect models with the log of total expected pay as the dependent variable. The final three columns report first-difference models allowing for a differential pay-performance elasticity between negative and positive return realisations. Low II firms are those with average institutional investor share ownership in the lowest quartile across all sample firms. All regressions include log employment and time dummies, fully interacted with the Low II dummy in columns (2), (4) and (5).

TABLE 9A: IV ESTIMATES OF SHAREHOLDER RETURN EFFECTS ON PAY

	OLS	IV	First-Stage F-Stat	Sample Size
Towers Watson Sample				
CEO	0.248** (0.055)	0.324** (0.145)	7.9	593
Level 2	0.173** (0.042)	0.212** (0.107)	14.0	3013
Level 3+	0.121** (0.026)	0.103 (0.074)	25.3	6551
Boardex Sample				
CEO	0.222** (0.030)	0.320** (0.073)	136.7	4277
Level 2	0.208** (0.025)	0.341** (0.059)	135.6	10464
ASHE Sample				
Managers	0.023** (0.006)	0.046** (0.022)	14.4	20445
Workers	0.011** (0.004)	0.004 (0.010)	19.3	94650

Notes: ** and * indicate significance at the 5% and 10% level respectively. The OLS estimates correspond with those reported in Table 2. The IV estimates use ICB sub-sector ex-UK shareholder returns as an instrument for *ln*TSR. All regressions include worker-firm match fixed-effects with time dummies and log of employment, and standard errors are clustered at the firm level.

TABLE 9B: IV ESTIMATES OF QUASI-RENT EFFECTS – USING 3-DIGIT INDUSTRY QRN

	OLS	IV	First-Stage F-Stat	Sample Size
Towers Watson Sample				
CEO	0.226* (0.115)	0.532* (0.279)	17.9	519
Level 2	0.157* (0.085)	0.553** (0.272)	24.9	2664
Level 3+	0.021 (0.039)	-0.208 (0.256)	16.6	5792
Boardex Sample				
CEO	0.200** (0.039)	0.616** (0.271)	10.4	4052
Level 2	0.239** (0.040)	0.382* (0.212)	8.6	9834
ASHE Sample				
Managers	0.038** (0.018)	0.151 (0.104)	4.0	18889
Workers	0.017 (0.012)	0.025 (0.066)	2.7	85713

Notes: ** and * indicate significance at the 5% and 10% level respectively. The IV estimates use quasi-rents for all UK-listed firms in the same 3-digit SIC industry (excluding the firm itself) for *ln*QRN. We exclude observations in which the firm accounts for more than 95% of industry sales. All regressions include worker-firm match fixed-effects with time dummies and log of employment, and standard errors are clustered at the firm level.

TABLE A1: RENT-SHARING IN US MANUFACTURING,1964-2005

	(1)	(2)	(3)	(4)	(5)	(6)
	1964-1985	1964-1985	1986-2005	1964-2005	1964-1985	1986-2005
$Log\ U_t$	-0.0108	-0.0097	0.0005	-0.0016*	-0.0036**	0.0009
	(0.0120)	(0.0082)	(0.0130)	(0.0010)	(0.0018)	(0.0014)
$(\pi/n)_{t-1}$	-0.0015	0.0004	0.0004	0.0014**	0.0023**	0.0011**
	(0.0022)	(0.0006)	(0.0006)	(0.0004)	(0.0009)	(0.0005)
$(\pi/n)_{t-2}$	0.0031	0.0012*	0.0004	-0.0006	0.0004	-0.0009*
	(0.0025)	(0.0007)	(0.0005)	(0.0006)	(0.0010)	(0.0005)
$(\pi/n)_{t-3}$	0.0026	0.0013**	-0.0002	0.0004	0.0022**	-0.0002
	(0.0021)	(0.0006)	(0.0006)	(0.0004)	(0.0007)	(0.0004)
$Log\ w_{t-1}$	0.3979**	0.2845**	0.2117**	0.8102**	0.7602**	0.6584**
	(0.0618)	(0.0471)	(0.0529)	(0.0110)	(0.0159)	(0.0147)
Long Run Elasticity	0.068	0.039	0.009	0.022	0.054	0.000
p$\sum(\pi/n)$=0		0.031	0.633	0.039	0.000	0.944
Personal Controls	Yes	Yes	Yes	No	No	No
R^2	0.9960	0.9962	0.9794	0.9953	0.9934	0.9795
N	295	348	320	19201	10098	9103

Personal control variables in columns 1-3 are experience, years of schooling, marital status dummies, race dummies, private sector dummy, percent female. All unemployment rates U and the dependent variable w (hourly earnings) are in natural logarithms. Profit-per-employee, π/n, is in levels. All variables, including the dependent variable, are measured as the mean of the observation in a year/industry cell. All regressions include year dummies. Standard errors, clustered by industry, are in parentheses.

Source: CPS March Files, NBER Productivity Database. Column (1) is from Table IV of Blanchflower, Oswald and Sanfey (1996).

TABLE A2: RENT-SHARING ACROSS THE ENTIRE WORKFORCE

	OLS	IV	First-Stage F-Stat	Sample Size
ASHE Complete Sample				
All Workers	0.007** (0.001)	0.032* (0.017)	15.8	498682
Non-Managerial	0.005** (0.001)	0.039** (0.019)	12.8	419037
Managerial	0.015** (0.004)	0.019 (0.026)	23.5	74697
Firms <= 50 workers	0.045** (0.003)	0.109** (0.044)	49.8	91453
Firms > 50 workers	0.002 (0.001)	0.024 (0.016)	15.5	403529
Firms > 500 workers	0.001 (0.002)	0.026* (0.015)	16.2	316057
Firms > 5000 workers	-0.001 (0.004)	0.027 (0.021)	14.7	195210
Manufacturing Firms	0.017** (0.004)	0.114 (0.096)	1.8	88251
Non-Manufacturing Firms	0.006** (0.001)	0.036* (0.020)	11.4	404271
ASHE Boardex Sample				
Using Global Accounts QRN	0.009 (0.012)	-0.011 (0.086)	2.3	78859
Using UK ARD QRN	0.006 (0.003)	-0.031 (0.049)	1.3	78859

Notes: The results in this table are for all workers in ASHE that can be matched to an enterprise group in the ARD. They include workers in both publicly-quoted and private companies. The IV estimates use quasi-rents for all firms in the same 4-digit SIC industry (excluding the firm itself) for *ln*QRN. We exclude observations in which the firm accounts for more than 95% of industry sales All regressions include worker-firm match fixed-effects, time dummies and lnEmp, with standard errors clustered at the firm level. The sample period is 2002-2008.
** and * indicate significance at the 5% and 10% level respectively.

TABLE A3: COMPONENTS OF TOTAL SHAREHOLDER RETURN EFFECTS – IN SHARES

	Base Salary Share	Bonus Share	Incentive Plan Share
Towers Watson Sample			
CEO	-0.102**	0.116**	-0.014
	(0.023)	(0.029)	(0.019)
Level 2	-0.085**	0.062**	0.023*
	(0.020)	(0.019)	(0.014)
Level 3+	-0.071**	0.047**	0.024
	(0.015)	(0.014)	(0.011)
Boardex Sample			
CEO	-0.094**	0.052**	0.042**
	(0.009)	(0.006)	(0.009)
Level 2	-0.095**	0.051**	0.044**
	(0.008)	(0.006)	(0.008)
ASHE Sample			
Managers	-0.030**	0.030**	
	(0.013)	(0.013)	
Workers	-0.010*	0.010*	
	(0.005)	(0.005)	

Notes: The total pay-performance elasticity is decomposed into base salary, cash bonus and incentive plan. The dependent variables are the shares of each component in total pay. The ASHE data only records base salary and cash bonus. All regressions include worker-firm match fixed effects, log employment and time dummies. Robust standard errors are clustered at the firm level.
** and * indicate significance at the 5% and 10% level respectively.

TABLE A4: COMPONENTS OF QUASI-RENTS EFFECTS – IN SHARES

	Base Salary Share	Bonus Share	Incentive Plan Share
Towers Watson Sample			
CEO	-0.065	0.049	0.016
	(0.042)	(0.045)	(0.039)
Level 2	-0.056**	0.025	0.031
	(0.025)	(0.031)	(0.027)
Level 3+	-0.027	0.008	0.019
	(0.030)	(0.021)	(0.023)
Boardex Sample			
CEO	-0.047**	0.050**	-0.003
	(0.014)	(0.012)	(0.015)
Level 2	-0.060**	0.044**	0.017
	(0.014)	(0.011)	(0.015)
ASHE Sample			
Managers	-0.023**	0.023**	
	(0.008)	(0.008)	
Workers	-0.020**	0.020**	
	(0.005)	(0.005)	

Notes: The total pay-performance elasticity is decomposed into base salary, cash bonus and incentive plan. The dependent variables are the shares of each component in total pay. The ASHE data only records base salary and cash bonus. All regressions include worker-firm match fixed—effects and time dummies. Robust standard errors are clustered at the firm level.
** and * indicate significance at the 5% and 10% level respectively.

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