CMPO Working Paper Series No. 00/16

Incentives in Organisations: A Selective Overview of the Literature with Application to the Public Sector

Simon Burgess [1]
and
Paul Metcalfe [2]

[1]*University of Bristol, CMPO and CEPR*
[2]*CMPO*

December 1999

Abstract
This paper provides a brief overview of the theoretical literature on how organisations provide employees with incentives to act in its interest and on the suitability of incentive schemes in different environments. Attention is drawn to areas that are appropriate to public sector organisations. A selection of relevant empirical literature is reviewed and related to the theory.

JEL Classification: J32, J33
Key Words: incentives; variable pay; public sector.

Acknowledgements
This project is funded by the Leverhulme Trust through CMPO.

Address for correspondence
CMPO
University of Bristol
8 Woodland Road
Bristol
BS8 1TN
simon.burgess@bristol.ac.uk

CMPO is funded by the Leverhulme Trust.

Non-Technical Summary

There has been a significant drive towards incentivising the public sector over the last twenty years a key element of which has been the introduction of incentive pay schemes for employees. This paper selectively overviews a sizeable economic literature relating to the provision of incentives within firms and discusses the suitability of this programme in light of the evidence.

The following broad conclusions are drawn:

- Employees do respond to incentives, often in sophisticated ways that may or may not be to the benefit of the organisation as a whole. The design of the scheme is hence extremely important.

- The pattern of existence of schemes is broadly in line with theory: where a worker has many tasks to perform or where output is difficult to measure, objectively assessed performance related pay is observed less frequently and subjectively assessed bonus payments are observed more frequently.

- Public sector workers are motivated by more than just their own income. We do not know if the same result holds for workers in the private sector.

- Differences in the pattern of existence of incentive schemes between the public and private sectors are not easy to interpret but may indicate that there are inefficiently few schemes in the public sector.

- Other aspects of organisation design such as promotion systems and hierarchical reward structures also provide incentives although there is less evidence on this.

This survey reveals several gaps in the empirical literature. We have very little evidence relating to incentives for those whose pay is determined subjectively by their superiors; we do not know how incentive schemes

interact with the need for proper behaviour by public servants and we do not have a full understanding of the provision of and response to incentives for teams.

1. Introduction

From the mid 1980s there has been a concerted drive to reform the British public sector. The major public utilities have been privatised, private finance has been encouraged for public investment projects, several public functions have been subjected to compulsory competitive tendering and substantial market elements have been introduced within remaining public services. All of these reforms can be characterised as driving forward the incentivisation of public sector organisations. A significant drive towards incentivisation has also occurred within individual public departments and organisations. Major changes in management information systems have been introduced with a view to clarifying management goals, and to analysing the efficiency with which resources are used to achieve them. A key element of this has been the introduction of performance-related pay designed to improve employee performance at all levels of public operations. This programme is set to continue with the March 1999 White Paper "Modernising Government" highlighting the idea of "taking a more creative approach to financial and other incentives for public service staff" (HMG,1999)

This paper relates to this last aspect, namely the reform and extension of variable pay incentives in the public sector. Understanding the principles behind the provision of incentives within organisations is an essential requirement to informed evaluation and discussion of these reforms. Recent advances in economic theory have shed light on many aspects of organisational design and made it possible now to discuss the suitability of incentive schemes in different environments. In this survey we selectively review this literature, focussing particularly on the evidence for the public sector. In doing so, we certainly do not exclude papers relating to the private sector, but we do largely avoid the bulk of the literature which has concentrated on the incentives faced by the CEOs of private companies. For other excellent recent surveys with a more general ambition, see Prendergast (1999), Malcolmson (1999), Murphy (1999) and Gibbons (1998). This literature also obviously has links to the classic principal agent literature and to personnel economics (Lazear, 1999).

We approach this survey with two central questions. First, how may an organisation organise and reward its employees in order to provide them with incentives to work in its interests? Second, why may different incentive structures be more, or less, suitable for different organisations and jobs? The paper is broadly organised as follows: section 2 considers method of pay in a static setting, section 3 focuses on careers and section 4 concludes. The appendix to the paper presents in table form a more comprehensive collection of papers than are referred to in the text.

2. Static models: the choice of method of pay

This section outlines the key theoretical issues concerning how different methods of pay provide incentives for employees to act in the firm's interest and why particular methods of pay may be more suitable for different firms and jobs. The empirical evidence on responses to incentive pay and sources of variation across establishments and jobs is then presented with reference to this theory.

(a) Theoretical Issues

The basis of performance-related pay schemes is that they are a response to some failure of information – for example, asymmetric information on workers' abilities or on their effort. This section reviews some of the issues involved in designing incentive schemes to deal with these issues.

(i) Sorting

Suppose potential employees are heterogeneous in ability in an unobserved way. Compensation by piece rates may be used as a screening mechanism to encourage only the most able to apply. Under piece rate compensation more able workers are presented with higher expected earnings from the employment relationship than would be earned in a salaried firm in a competitive labour market. This sorting mechanism therefore implies that the average ability of the workforce would then be expected to be higher in firms paying piece rates. Lazear (1986) develops a model along these lines

explaining the choice between salaries and piece rates as driven by the trade-off between the costs of a performance measurement system and the benefits such a system incurs with regard to improved sorting of workers.

To isolate the influence of sorting on choice of method of pay, effort considerations are ignored and hence workers' lifetime output *(q)* is assumed to be fixed. We deal with motivation to provide effort later. Let the density of *q* be *f(q)*, and the cumulative density be *F(q)*. Let one firm pay by salary and another pay by piece rates, let the average cost of monitoring output be q and let the salary offered be *S*. In a zero-profit equilibrium workers bear the fixed cost of monitoring, so any workers with $q < S + q$ will work at the salaried firm. The model defines a cut-off value of *q*, q^*, such that all workers with output above work for piece-rate firms and all those below work for salary firms. In order for piece rates to succeed as a screening mechanism, we require there to be some *S* that attracts workers with $q < q^*$ and that zero profits can be achieved. It is hence necessary to show that there exists an S that satisfies:

$$S = \frac{1}{F(S+q)} \int_0^{S+q} qf(q)dq$$

The right hand side is the expected output of a worker at the salary firm and thus this equation represents the zero profits constraint. Below q^*, workers will be competed away from the piece rate firm to the salaried firm; given that we also have that $q^* = S + q$, we have:

$$q^* - \frac{1}{F(q^*)} \int_0^{q^*} qf(q)dq - q = 0$$

This defines q^*. The middle term on the left hand side is the average output of the work force in the salaried firm, say $\bar{q}(q^*)$. The existence of an interior solution for q^* depends on the distribution *f(.)*. For example, as long as $q^{\max} - \bar{q}(q^{\max}) \geq q$ then such a q^* exists and hence salary and piece rate firms can exist side by side. If $q = 0$, then the salaried firm could exist with the lowest output worker at that firm. That worker would be indifferent between the two firms.

The above model shows that, where piece rate firms and salaried firms exist side by side, one would expect the workforce of the firm paying piece rates to be higher paid and be more productive. Firms/jobs with a higher cost of measuring output are less likely to operate piece rate systems. Also, piece rates are more likely to exist where workers are more heterogeneous in ability for a given cost of output measurement. These results are derived purely as a result of sorting and do not make any assumptions about the motivational effects of piece rates.

(ii) Incentives versus insurance

The aspect of the choice between variable pay and straight salary that has received most attention in the literature is the view paying PRP induces employees to work harder. On the other hand, one reason why firms may avoid high powered incentive pay contracts is that they transfer a lot of risk onto workers. The classical principal-agent moral hazard model suggests that the use of PRP is driven by this trade-off between providing incentives and providing insurance to risk averse workers. The following model formulates the optimal performance bonus when effort monitoring does not occur at all and output produced is a noisy measure of effort. The model depicts an agent who exerts an effort *(a)* at a cost *c(a)* such that $c' > 0$ and $c'' > 0$. This effort translates into output *(y)* through the stochastic production function, $y = a+e$, where e is a normally distributed noise term with mean zero and variance s^2.

The principal owns the output but contracts to share it with the agent by paying her a wage contingent on her output: $w = w(y)$. The full incentive contract is $w = y - F$, where F is the fee charged to the agent for use of the firm's assets. This contract perfectly internalises the firm's objective but transfers all the risk associated with the stochastic production technology onto the agent. We assume that the agent is risk averse and hence, because her output is uncertain, she desires insurance against the possibility of a bad outcome. The full insurance contract is $w = s$, where s is a flat salary and hence the wage is not contingent upon output; this, however, provides no incentive to exert effort. The optimal contract is therefore determined by the trade-off between providing insurance and inducing effort. The model characterises the optimal coefficient on output, b^*, in the linear pay-off function $w = s + by$. The solution to the model predicts that the incentive component of pay is smaller for more risk-averse

agents and those where the marginal disutility of effort increases at a faster rate. A further result is that the incentive component ought also to be smaller for larger variance in the noise term of the production function.

In his recent survey, Gibbons (1998) argues that the incentive/insurance trade-off is now much less central to theoretical endeavour in this field. This may be because of its lack of explanatory power and also, in Gibbons' words, because he finds it "strangely distant from real attempts to tie pay to performance" (p. 117).

(iii) Measurement Costs

Lazear (1986) presents a general model which abstracts from risk and, instead, focuses upon the relative costs of observing output *(y)* and effort *(a)*. Effort costs the agent *c(a)*, as above. Suppose that a competitive firm can observe output at cost q_1 and can observe some minimum effort level $(\bar{a})$ at cost q_2. This minimum effort level is enforced as a condition of contract. Suppose further that $q_1 > q_2$ and $y = a$.

If the firm adopted a piece rate *p(y)* paying $y - q_1$, this induces effort of $a^* = argmax_a [y - c(a)]$, where a^* is defined by $c'(a^*) = 1$. If the firm adopts a salary scheme with exogenous minimum effort $\bar{a}$, the worker will simply exert effort level equal to $\bar{a}$ and will be paid $\bar{a} - q_2$. A piece rate is then paid if and only if:

$$a^* - q_1 - c(a^*) > \bar{a} - q_2 - c(\bar{a})$$

This generates two main predictions. Piece rates are more likely the lower is the cost of observing output relative to observing effort and the higher is the extra effort that the piece rate scheme induces. These two results are highly intuitive. Because the use of PRP is hypothesised to be driven by the relative cost of monitoring effort and measuring output, a further prediction is that the likelihood of PRP is negatively correlated with the proportion of the workforce who are supervisors or managers. Where more resources are diverted towards supervising workers' efforts, PRP is less required as a motivational mechanism.

It is the correlation with measurement costs that has been one of the main focuses for empirical predictions concerning associations between firm characteristics and method of pay. Perhaps the most commonly cited measurable indicator of measurement costs

in the literature is the size of the workplace. The number of employees is predicted to have a positive influence on the likelihood of PRP since larger firms can spread the fixed cost of measuring output over more employees. On the other hand, the cost of monitoring effort is assumed to be at least as large, if not larger, in establishments with more employees. A second prediction along these lines is that greater occupational dispersion within an establishment makes PRP less likely. If the firm has to pay a fixed cost of a PRP system per occupation, more occupations simply means fewer workers per occupation, making it less likely.

(iv) Multi-tasking

There are now many examples of incentive pay schemes that are deemed to be failures, because the outcome for the organisation is not what it intended. Kerr's (1975) article famously entitled "On the folly of rewarding A while hoping for B" contains many examples, as does Baker, Gibbons and Murphy (1994). Typical cases may include employees aiming to hit quantity targets regardless of quality or failing to co-operate with other employees. Perverse incentive effects generally arise when a job requires workers to perform several tasks but only some are measured and rewarded. Unsurprisingly, in such circumstances, the worker will concentrate his efforts on the rewarded tasks to the detriment of the overall organisational objectives.

Baker (1992) and Holmstrom and Milgrom (1991) both emphasise the distinction between output and the agent's measured performance. An agent's output is, in practice, often extremely difficult to verify even when the production technology directly maps effort into output. In Baker's model, the output of a worker *(y)* of concern to the firm is the total contribution she makes to firm value; however the verifiable output measure *(p)* may include noise. Agents bias their effort *(a)* towards those actions that increase *p* away from those directed towards *y*. A good performance measure is one where there is a high correlation between *dp/da* and *dy/da*. The higher is this correlation, the more efficient it is to tie pay to this measured performance.

Holmstrom and Milgrom (1991) introduce a multi-tasking model which explains why incentive pay is often not appropriate even when accurate performance measures are available. A similar structure to the standard agency model is used. The output is again

given by the production technology: $y = a + e$; however, a is here a vector of efforts and ε, the noise term, is normally distributed with mean 0 and variance-covariance matrix S. The cost of effort $c(a)$ over the full set of tasks is assumed to be strictly convex. This model allows an analysis of the effects of different degrees of measurability of the agent's tasks and different cross cost elasticities of effort on the optimal incentive pay scheme. In general, it is shown that if the principal wishes the agent to allocate effort towards a task that is not easily measurable then incentives on the measurable tasks must be weakened[1]. When the agent has an outside task option, optimal incentives are also weaker the more that effort is substitutable between outside and inside tasks. Holmstrom and Milgrom further describe how the subset of tasks performed within an individual job and the method of pay for that job, are jointly determined. It is predicted that subsets of tasks will be grouped around the costs of measuring and rewarding performance. Some workers will perform a set of easy to measure tasks and will be paid based on measured performance. Others will perform a set of difficult to measure tasks and will receive a fixed wage.

There are two empirical predictions generating from this theory. First, we should observe examples of firms getting what they pay for, not what they intended with badly designed incentive schemes. Secondly, establishments should be less likely to operate a PRP scheme for jobs that involve many, complex or difficult-to-measure tasks. Much of this sounds appropriate to the public sector. In the public sector, the real value of output is typically difficult to measure. Multi-tasking theory shows that it is inappropriate to introduce PRP in such circumstances. For example, if teachers were to be rewarded on the basis of some measurable outcome such as exam results, they may be expected to bias their efforts away from other important activities comprising children's overall education. In the NHS, an established political priority for many years has been the reduction of waiting times. Concentrating managerial effort in hospitals towards achieving this goal may have biased resources away from other goals, such as caring for those most in need of treatment. The complexity of a job has a direct relation to the desirability or otherwise of objectively measured PRP.

1 This is the case only for substitutable tasks however. Where efforts are complementary in the agent's cost function, optimal incentives are stronger.

(v) Subjective performance evaluation

An alternative way of providing incentives when there are complex jobs with many tasks is through *merit pay*. This form of variable pay is based on subjective assessment and hence allows a more holistic appraisal of an employee's performance whilst retaining the incentive owing to the link between pay and performance. Merit pay, however, is not itself free from problems. Since an essential feature of subjective evaluation is that it cannot be verified by a third party, the assessor may have an incentive to distort the performance rating she gives ex-post for her own private gain. When the assessor is not the residual claimant, she has an incentive to distort the ratings in order to further her own benefit at the expense of the firm. For example, a worker may divert his efforts towards currying favour with his supervisor if he expects this to result in a better evaluation. Alternatively, the supervisor may be known to be reluctant to give harsh appraisals or truly separate out the good performers from the bad in order to enjoy a quieter life. In this case, the employee's incentives are weakened. In general, wherever the supervisor's incentives are not sufficiently aligned with the organisation's, the incentives of the employees will be distorted or weakened.

When the assessor is the residual claimant, she has an incentive to downgrade the ratings she gives in order to pay out less compensation. Knowing this, the employee's incentives are again weakened. Bull (1987) presents a formal model showing how this problem may be at least partially overcome in repeated settings between worker and assessor. If a firm promises an employee a bonus if it observes that output is high yet then reneges on that promise, future incentives facing the worker will be weakened. When the cost of these weakened incentives is high and the worker's discount rate sufficiently low, the firm has an incentive to truthfully reveal its assessment of the worker's output. The incentive for the firm to renege also depends, however, on the size of the bonus in question. The larger the bonus, the more the firm gains by reneging. Baker, Gibbons and Murphy (1994) present a model combining both relational (subjective) and objective performance related components of pay. Pure objective contracts are assumed to lead to biases induced by imperfect performance measures whilst relational contracts are susceptible to the opportunity for the firm to renege. Employing both types of assessment is shown to allow the firm to do better than operating either in isolation. The subjective evaluation reduces the bias inherent in

the objective measure whilst the objective measure reduces the size of the subjectively assessed bonus that could be saved by reneging. The employee thus faces stronger incentives as a result of the combined methods of pay.

(vi) Multiple principals

A key development in agency theory with particular relevance to the public sector is the influence of *multiple-principals* on the optimal incentivisation of the compensation contract. Public agencies often do not have a single objective (e.g. profit) that characterises their mission. Instead, as Dixit (1997) notes 'they are answerable to several different constituencies with different objectives. In technical terms they are "common agencies" with several "principals"'.

Dixit (1997) extends Holmstrom and Milgrom's (1991) bilateral multi-tasking model to the case where several principals contract with a single agent over a range of tasks. The agent's decision rule is to choose the optimal effort level to exert on each task according to his private costs and benefits given the full set of contracts. When the principals collude to provide a single contract to the agent, the same result is found as in the Holmstrom-Milgrom model. When the principals cannot collude however, each principal sets a reward schedule that is privately optimal given each of the other principal's reward schedules and the agent's optimal decision rule. But the lack of collusion leads to a negative externality weakening incentives relative to the collusive case. The implication of this work is that providing incentives for a government agent to act in alignment with the social optimum is more costly when his reward depends on satisfying several non-collusive principals.

(vii) Group incentive schemes

Most jobs require co-operation with colleagues at some level. The benefits of working as a team over individual production are often extremely large and it may be difficult to isolate and reward the output of an individual in such production settings. These externalities clearly influence the nature of the optimal incentive scheme. Standard economic theory tells us, however, that group based incentive schemes including profit sharing and team bonuses may have little effect on individual performance because of the incentive for each worker to "free ride" on his colleagues' efforts. The larger is the

size of the group, the more incentive there is to free ride. The fact that many establishments do operate group PRP schemes, however, suggests that they may provide a significant incentive for employees (see e.g. Drago and Heywood, 1995). Kandel and Lazear (1992) investigate some alternative ways in which the free riding problem may be resolved in actual team production settings by means of peer pressure.

Peer pressure translates into incentives by punishing workers who deviate from what is expected of them by guilt and/or shame. When team workers are able to monitor each others effort more easily than a third party, the firm may offer a group PRP contract which induces team members to apply peer pressure or which induces feelings of guilt when workers put in too little effort. Kandel and Lazear hypothesise that profit sharing creates empathy towards those who receive the residual profit. Workers more readily empathise with other workers than with faceless shareholders. Further, the more empathy there is towards the joint beneficiaries of one's effort, the greater is worker motivation.

(b) Empirical evidence on method of pay

The empirical evidence is organised as follows: First, we consider the basic question, do incentives matter? Throughout the theory, it has been assumed that employees respond to the incentives generated by their compensation contracts. Here the evidence on this claim is evaluated using data on both public and private organisations. Second, we assess the way in which use of different methods of pay varies across different firms and jobs.

(i) Do incentives matter?

We interpret this question to mean two things. First, do people respond to incentives as the theory suggests they should? Second, do they lead to the outcomes that the organisation intends?

An immediate implication of the hypothesised benefits of variable pay is that, ceteris paribus, workers ought to be more productive and receive higher total wages under PRP than under time rates. Testing for this is difficult for two reasons. First, the determinants of the choice of method of pay must be controlled for, or else it cannot be

claimed that any association between contract type and productivity rates owes to the contract and not to unobserved differences between workers and firms. Second, differences across workers such as level of education and experience will also affect productivity and should be controlled for. For this reason, simple cross-sectional productivity differences between those firms paying piece rates and those paying time rates do not adequately identify the pure effect owing to method of pay. Lazear (1998a) uses a very rich and detailed dataset on a single firm that phases in a PRP scheme over a period of time, and offers the best estimate yet of both the motivation and the sorting effects of variable pay.

Lazear's investigation uses data on a large car windscreen fitter (Safelite) that changed compensation structure from time rates to piece rates over a period of 19 months. The same workers and the same firm are observed under both regimes and output is accurately measured. Because of the phasing-in period, productivity observations under both methods of pay are observed simultaneously. Exogenous productivity effects such as other management changes and weather effects can thus be controlled for by incorporating month and year dummies in the multivariate analysis. We can therefore be confident that the effects of method of pay are truly identified. The switch to piece rates was found to cause average output to rise by 44%. By using worker-specific dummies, it is found that half of this increase can be attributed to better workers joining the firm and half to motivation effects. Average wages also increased by about 10% following the switch. Thus for a given individual at a particular firm switching from time rates to piece rates caused his productivity to rise by 22%.

Fernie and Metcalf (1996) also examine the productivity effects of incentive pay using data on jockey's pay and performance over 13 years. There are two commonly used methods of pay in this sample, an incentive scheme whereby jockeys receive 7% of any prize money and a retainer scheme which gives jockeys a flat fee for riding for one owner. Horses are ridden by many riders and some jockeys ride under both the retainer and the incentive pay schemes. It is therefore possible to identify the effects of the method of pay. It is found that the incentive scheme elicits much better performance than the retainer scheme. Over the sample the retainer scheme gradually became less

and less popular, presumably owing to its poor performance relative to the incentive scheme.

These two studies verify the hypothesis that incentive pay has an effect on performance in two specific industries. An alternative approach is undertaken by Booth and Frank (1999) using individual based data. They examine whether, as predicted, individual wages are generally higher under PRP across the UK. It is impossible in this dataset to distinguish between sorting and motivation effects, but the advantage of their approach is that it is representative of the whole of the UK, both public sector and private. Data on individuals' characteristics are used to control for their employing firms' information at selection. A remaining wage differential between those individuals paid PRP and those paid time rates therefore identifies a sorting and / or a productivity effect. Booth and Frank find that the estimated return to PRP is 9% for men and 6% for women.

A job training programme in the US, deriving from the Job Training Partnership Act (JTPA), was set up with a system of explicit incentives for the training agents. Labour market outcomes for the participants have been much studied, but the programme has also produced a number of studies on the effects of the incentives. They show that people do respond to incentives, and that they respond in sophisticated ways.

Heckman, Smith and Taber (1996) investigate the response of training centres to these incentives. Under the JTPA system, local training centres receive monetary rewards based on the employment levels and wage rates attained by graduates of the programme. This creates an incentive for the manager to 'cream-skim' the most employable of the applicants into the programme. Heckman, Smith and Taber estimate the probability of acceptance into the programme using predicted earnings levels and earnings gains, calculated from observed human capital variables, as independent variables. In fact, they find that people with lower expected earnings levels are significantly more likely to be accepted into the programme. Weaker evidence suggests that those with larger expected gains are more likely to be accepted. These results contrast with the cream-skimming prediction, suggesting instead that for these bureaucrats at least, preferences for helping the disadvantaged overrode pecuniary incentives.

As we noted earlier and has been shown by many other researchers, individuals can respond to incentives in sophisticated ways. One clear example of this also arises from the JTPA programme. Courty and Marschke (1997, 1999) examine how the incentive structure of the JTPA programme affects the way in which the programme administrators report outcomes and the effect of their timing strategies on efficiency. The administrator can graduate a participant at any time between the end of training and 90 days thereafter and is awarded a bonus if an annual target is met for employment of programme graduates by June 30 of each year. A simple incentive model predicts that throughout the year the reporting date relative to the end of training will take place as soon as the participant is employed or at the end of the 90 days. In June however, reporting behaviour is predicted to vary according to how well the agency has performed relative to its target. If the agency cannot possibly reach its target, or if it has already surpassed its target by the end of June, then it will graduate all participants who have completed their training. Otherwise, however, the minimum number will be graduated which enable the agency to achieve its quota. The evidence confirms that this model does indeed reflect how agencies act as the deadline approaches. Further, Courty and Marschke show that this timing strategy adversely affects the efficiency of training. It is found that earnings impacts in the last month of the year are lower than they are at other times of the year. It is hypothesised that this is a result of excess resources being diverted to accounting away from human capital activities.

Asch (1990) examines a similar situation in the public sector showing how Navy recruiters reacted to an incentive scheme which rewarded workers if they achieved a quota of recruits before the cut-off date. Asch finds that the number of recruits was highest in the period immediately prior to the quota cut-off date and lowest immediately afterwards. Crucially, it was also shown that the average quality of recruits fell as the cut-off approached. The interpretation of this is that as the deadline approaches, the recruiters shade down their selection criteria in order to be able to hit their quantity target.

(ii) Variation in methods of pay

The theory makes several predictions concerning the choice of method of pay for an employee. PRP ought to be less likely when output is a noisier signal of effort, when the employee is more risk averse, when output is more costly to measure because of firm characteristics and when the output of a job is multi-dimensional. Subjective evaluation of performance is more likely in cases of multi-tasking.

There is very little evidence suggesting that risk is the primary factor determining the performance sensitivity of compensation contracts. The hypothesis that the variance in output ought to reduce the performance contingent component in compensation is tested in Garen(1994). This paper uses a cross-section of 415 firms and finds, as predicted, that the variance of firm value does have a negative effect on the sensitivity of CEO compensation to this measure of performance. This effect is not large, however, and hence there is probably more than just risk that determines pay-performance sensitivity.

Brown (1990) uses data on a large cross-section of US, predominantly manufacturing, establishments to empirically examine the determinants of firms' choice of method of pay. Size is found to have a positive influence and occupational dispersion is found to be negatively correlated with the likelihood that an establishment operates a PRP scheme for any employees. Drago and Heywood (1995) perform a similar investigation using Australian establishment data and find again that size has a significant positive influence on PRP likelihood. They also verify the prediction that the number of supervisors as a proportion of the workforce is negatively correlated with PRP likelihood.

Fernie and Metcalf (1998) investigate the pay systems and characteristics of four individual workplaces. Those investigated are a bookmaker (BM), an (ex-civil service) executive agency (EA), a contracted-out (from local authority) unit collecting parking fines (PK) and the advertising section of a daily newspaper (AD). The reason for the choice of these four occupations is that they all involve computer telephony (i.e. are call centres) with the exception of BM which is used as a comparator. The method of pay for each workplace is as follows: BM makes virtually no use of PRP; EA makes modest use of PRP; PK has a team-based PRP system; AD has the highest PRP to

basic pay ratio of 0.53 - it also has 1/3 team based PRP component. These results are used alongside workplace characteristics to test whether theoretical predictions hold and which factors are most important in each context.

The first fact to note is that BM is the only workplace not to offer any significant PRP component. This can be explained by the fact that the attitude and effort of cashiers at BM is monitored. The only way to measure output would be in terms of money collected on bets or number of customers served. Neither of these are under the control of the cashier and are hence not very precise measures of effort. Monitoring, on the other hand, is easy since the span of managerial control is small. Out of the other three occupations, all of which involve computer telephony, only AD is in the private sector. Both EA and PK are market-tested public services. It was found in cross-section data that being public sector has a negative influence on the incidence of PRP. Here, it is shown that the ratio of PRP to basic is smaller at EA and PK than at AD. The high ratio of 0.53 for AD could also reflect the fact that operators there are more directly responsible for revenue generation than at EA. Output could hence be said to be more important than input. Another possible source of the divergence in PRP to basic pay ratios between AD and EA is the fact that labour is more homogenous at EA. Stricter recruitment procedures operate at EA and employees earn more at AD. These two facts lend support to the sorting properties of high powered incentives.

One fact which seems inexplicable by standard theory is the operation of a team based PRP system at PK. Work is very individual based at this workplace and the tasks are known to the supervisor but not to other team members. This seems in direct contrast to the prediction from theory that team based incentives are more likely when group norms enforce individual effort when it is known to the team but not to the supervisor. Aside from this observation, however, the evidence from this case study, and from the two cross-section studies of Brown (1990) and Drago and Heywood (1995), lends support to the idea that measurement costs significantly influence the likelihood of PRP in an establishment.

Slade (1996) directly tests whether actual contracts are concordant with the Holmstrom and Milgrom (1991) multi-tasking model using data on contracts between

96 oil companies and their branded service stations in Vancouver. Petrol station managers operate either a convenience shop or a repair shop as well as selling petrol. It is argued that convenience shop revenues have higher complementarity with petrol sales than do repair revenues, where complementarity is composed of three elements, high cross-price elasticity of demand, high covariance of shocks and low effort substitutibility. Thus, the Holmstrom and Milgrom (1991) prediction is that petrol stations with convenience shops are more likely to have contracts biased towards wages than those with repair shops. Intuitively, this is because, in environments where the cross-price demand effect is large, greater effort in the primary activity reduces revenues in the secondary activity by a larger amount. Also, insurance is more desirable when there is revenue complementarity between activities since risk can not be costlessly diversified. This prediction is verified with petrol stations operating repair shops more likely to retain the residual from gasoline sales. Those with convenience shops are more likely to be paid a salary and a small commission on gasoline sales. Brown (1990) also finds support for this prediction such that jobs with a variety of duties are less likely to be compensated by PRP.

Paarsch and Shearer (1997) investigate the determinants and productivity effects of different methods of pay in the tree-planting industry of British Columbia over a 6 month planting season. A model of contractual choice is constructed specific to this industry which is based upon interviews with managers. Managers choose whether to pay piece rates or time rates depending on the tree-planting conditions. Output is easily observable and does not vary according to the conditions. The variability derives from the quality dimension of the planter's job. A worker can plant trees well or badly and the marginal effort required to plant a tree well increases as conditions worsen. Poorly planted trees will not survive and this exposes the firm to possible fines by the government and loss of future contracts. The worker is more likely to plant trees badly under piece rates when conditions are poor. Interviews with management suggest that the use of piece rates is inversely related to the average quality of the conditions for this reason. Thus, in the terminology of Baker (1992) dp/da is more closely correlated with dy/da under good conditions than bad conditions and hence the use of piece rates is more appropriate in these circumstances. Paarsch and Shearer's analysis allows them to place bounds on the effect of piece rates on effort. The lower bound is taken to be

the increase in worker wages, which is found to be 6%. The raw productivity difference, which is taken to be the upper bound is found to be 35%. The structural form of estimation they adopt to condition for the determinants of contract selection (i.e. ground planting conditions) leads to an estimate of about 10% for the increase in productivity of a given worker owing purely to piece rates.

Brown and Philips (1986) adopt an alternative approach to the issue of firm's choice of method of pay. This paper analyses the Californian canneries industry over 70 years, providing an explanation of the shift from piece rates to time rates as an adaptation to the change in production technology. Piece rates were originally used as a means to extract as much labour as possible from a limited pool. No pre-job screening was necessary, productivity was entirely determined by the worker and output was easily measured. As production became more mechanised, however, the opportunity cost of low productivity workers increased but output was still predominantly determined by labour input and hence pre-job screening was introduced but piece rates were still retained as an incentive mechanism. Eventually, production became so mechanised that the main function of workers was to correct machine errors. The pace of production became determined by machine. Time rates were introduced because piece rates would create perverse incentives to cause errors and would not increase production.

The first point of interest arising from this study concerns the idea that piece rates are used to sort workers by ability. Clearly in the Californian canneries industry, when there was an opportunity cost to employing a worker, even while still relatively small, piece rates were an insufficient sorting mechanism. Pre-job screening was necessary even though piece rates were still kept as an incentive mechanism. This does not mean that the use of piece rates does not sort workers but that the mechanism may well be insufficient in the presence of an opportunity cost of employing a worker.

The main factors driving the firms' choice of method of pay here seem to be the variance in the value of labour's contribution to total output and the cost of an accurate performance measure. To begin with, the variance was large and the cost of measurement small hence piece rates were used. With production mainly determined by the pace of the machines, the variance owing to differences in ability or effort of workers became smaller. The cost of measuring performance also increased; as

mentioned, it would not suffice to merely count the number of corrected machine errors since this would create perverse incentives. In this environment, time rates were thus more appropriate.

Freeman and Kleiner (1998) also take an approach along these lines, examining longitudinal data on a single shoe manufacturer to explain why during 1970s to 1990s most US shoe manufacturers switched from piece rates to time rates as a survival strategy in the face of foreign competition. They found that the switch was part of a larger move towards continuous flow production with job rotation and small inventories. This resulted in reduced productivity per worker yet brought offsetting cost savings in the form of lower hourly wages, lower monitoring costs and increased flexibility. These allowed new styles to be introduced quicker. The key point of this study is that in a climate of rapid change, the cost of continually updating a piece rate system can exceed the productivity benefits it brings.

In a separate paper, we use cross-section establishment data from the 1990 Workplace Industrial Relations Survey to investigate the pattern of existence of incentive schemes in private manufacturing, private services and public services (Burgess and Metcalfe (1999)). We confirm that public service establishments are much less likely to operate any incentive schemes than private firms. We then investigate whether this is optimally the case or whether the public sector is simply inefficiently incentivised. Controlling for variation in size, union density, and workforce composition variables, which identify general measurement issues, the study compares existence of both PRP and merit pay across both sectors by 8 occupation groups. Disaggregating the existence of schemes by occupation identifies the importance of multi-tasking and allows an insight into core public / private differences.

The hypothesis is that within each occupation, employees in public and private service jobs perform broadly the same tasks in terms of complexity and measurability. Thus if multi-tasking issues are the core determinants of the optimal type of incentive structure and the public sector is efficiently run, then we should expect to see no difference in the pattern of existence of incentive schemes between public and private services. If, as Dixit (1997) claims, there are many principals to whom public service employees are accountable and this presents a constraint on the use of variable pay schemes, then we

should expect these problems to only arise for decision makers. An unskilled manual worker such as a cleaner faces no accountability difference if she works in a university or in a private software company. However the optimal constraints imposed by working for multiple principals will, if at all, affect managers and professionals only. If this is the case, then we should expect to see no difference in the existence of PRP for manual workers but fewer establishments operating a PRP scheme for managers and professionals. If the public sector is simply inefficiently incentivised, then we should expect to see fewer incentive schemes for all occupations. The key finding is that there is no difference in the likelihood of an establishment operating a PRP scheme for manuals but public service establishments are much less likely to operate a PRP scheme for non-manual workers.

The choice of scheme is also considered. It is found that merit pay, as predicted, is more likely than PRP for non-manuals whose output is harder to measure and PRP is more likely than merit pay for manuals. PRP is more likely for manuals than it is for non-manuals and merit pay is more likely for non-manuals than it is for manuals. Looking at differences across the public/private services divide, we see a big difference between sectors in PRP likelihood for non-manual workers. This may be because of a different occupational composition within the professional / technical group. Salespeople, for example, are a classic case where PRP works well and these come into the same occupational category as nurses and teachers. If this is the case, then merit pay ought to optimally be used more prevalently for non-manuals in the public sector. In fact, however, it is found that merit pay is also significantly less likely in the public sector for all occupations. The study concludes that the lack of incentive schemes, particularly subjective performance evaluation (merit pay) may be evidence in favour of inefficiency in the public sector. However, we argue that this conclusion cannot be established strongly as there may be other constraints on the use of incentive pay in the public sector, possibly related to the common agency problem.

Using cross-section establishment data drawn from the Australian Workplace Industrial Relations Survey, Drago and Heywood (1995) regress the likelihood of PRP schemes based on different group sizes on establishment characteristics. These schemes range in scope from individual to firm level PRP appraisal. Total employment is found to have a

significant positive influence on group and higher than workplace level PRP. This accords with findings by Encinosa, Gaynor and Rebitzer (1997). They construct a model of the extent of PRP in compensation contracts that includes group norms. This model is tested on medical group practices and it is also found, as predicted, that the size of the group has a significant negative influence on the probability of compensation being equally distributed across group members.

Kandel and Lazear (1992) suggest that other aspects of human resource management which promote a corporate culture and/or teamwork should also be correlated with group incentive schemes. Drago and Heywood's evidence provides support for this hypothesis. Employee participation in the form of quality circles and the proportion of managers promoted from within the organisation are both positively correlated with group PRP schemes. The number of casual workers as a proportion of the workforce is also found to have a significant negative influence on the incidence of group PRP and profit sharing. Public sector establishments are found here to be significantly less likely to have group and workplace level PRP schemes.

(iii) Conclusions

Our survey of the evidence suggests the following conclusions:

- Workers do respond in sophisticated ways to incentive schemes
- Sometimes the response undermines the intended effects of the scheme
- Organisations' choice of type of incentive scheme for different jobs does generally reflect the issues that theory suggests – the importance of measurement, the scope for multi-tasking and effort mis-allocation.
- Differences between public and private sector are not easy to interpret but may indicate that the public sector has inefficiently few incentive schemes.

3. Careers

Whilst the literature discussed in the previous section provides an insight into the choice of method of pay it is, in itself, merely a partial account of the overall choice of incentive structure at the disposal of the firm. Casual empiricism tells us that there is more to incentives than simply more jam today. Many individuals who do not receive any performance related bonus are nevertheless strongly motivated by the possibility of either promotion within the organisation or a better job offer from an outside firm. This section outlines and evaluates the main themes of the literature concerning careers.

(a) Career concerns

The theory of the incentives generated by career concerns, or implicit incentives, has been relatively overlooked in relation to the large literature on explicit incentives generated, within firms, by alternative methods of pay. The central idea behind implicit incentives is that the worker exerts effort in order to influence the market's beliefs about his talent. Thus even when an employee is paid a fixed wage, he may be motivated by the effect his effort has on future wages. The seminal model is presented in Holmstrom (1982b). In this model there are no explicit rewards yet wages depend on expected productivity which is a function of observed performance in previous periods. This creates an "implicit contract" linking contemporaneous performance to future wages. There are two parties in the model, the market and the worker. Both are assumed to know the distribution of talent across workers, the distribution of noise in the production process and the worker's optimal decision rule. When talent is fixed, the firm sequentially infers a more precise belief about the worker's talent with each observation on output. The more precise is the firms belief, the less incentive there is for the worker to exert effort. As the number of observations becomes large, optimal effort tends towards zero. When there is no uncertainty, there is no effect of effort on beliefs and hence no effort will be exerted.

This extreme result depends on the initial assumption that talent is fixed. Holmstrom goes on to assume that talent evolves over time due to effects such as learning by doing; this introduces extra uncertainty about talent at every observation on output. In this case, the precision of the market's belief about an agent's talent tends to a constant state where the learning through observations on output exactly offsets the talent shocks. This is associated with a positive optimal level of effort for the worker. Three

key results are generated from this model. First, career concerns are more effective if the evolution of talent is more stochastic or if the observations on output are more accurate. The former captures the intuition that when there is more uncertainty about how potentially talented he is, an employee will work harder since his effort has a stronger impact on future wages by influencing this belief. The more accurate are the observations on output the larger is the return on effort in a single period since more will be inferred by the market as a result of each observation. The second key result is that, assuming that the precision of the markets belief on talent converges upwards to its stationary state, effort levels converge monotonically downwards to their stationary state. That is, young workers will work harder than older workers since they are more able to establish a reputation through effort when the market's information is more diffuse as it is thought to be for younger workers. Finally, it is shown that when non-linear returns to talent are introduced, career concerns induce greater effort when the returns to talent are convex rather than concave. This result also holds intuitive appeal.

The nature of incentives generated through career concerns may be particularly important in the public sector. Dewatripont, Jewitt and Tirole (1999) extend Holmstrom's model by including multiple tasks and analyse the incentives of government agency officials. Of particular motivation to their analysis are a set of observations by Wilson (1989). Wilson stresses three key differences between government agencies and private firms. The first is the preponderance of career concerns over financial incentives facing government officials. Second, the objectives of the government agency are often unclear and, third, they often operate with limited autonomy in relation to private firms. Wilson also notes that successful government agencies have a clear focus on a specific mission. A formal analysis using the multitask career concerns model generates a set of results consistent with these observations. It is derived that expanding the set of tasks pursued by the worker typically reduces total effort. This is because the link from performance to the market's inference about talent becomes weaker with more tasks. Uncertainty over the nature of tasks pursued by the worker or the effort allocation between them is also shown to reduce total effort. These two results taken together support the observation by Wilson that successful agencies pursue a narrow and clear mission. They also lend support to the idea that

hiring professionals who focus on a specific task can be relied upon for greater effort than a generalist bureaucrat and should receive more autonomy.

One of the key insights from this literature is that there is scope for improving performance in the public sector simply through organisational design. Improving the clarity of missions and allocating a minimal number of tasks to public sector officials may substantially improve incentives via individuals' concern for their careers and clarity of goals.

These insights have substantial intuitive appeal; however, there is little, if any, hard empirical evidence on the predictions generated. There are two notable exceptions, apparently contradictory. The first is Gibbons and Murphy (1992) who test an implication from Holmstrom (1982b) that explicit pay for performance contracts ought to be used more for older workers since career concerns do not provide as much an incentive as they do for younger workers. This prediction is verified using data on CEO contracts. It is found that pay-performance elasticity increases with proximity to retirement. Using data on sales force compensation however, Coughlin and Narasimhan (1992) find evidence that compensation actually gets more weighted towards salary with years of service. Evidence from the public sector on this issue is limited to informal analyses such as Wilson (1989).

(b) Tournaments

Tournament theory models promotions as prizes that are allocated to the workers who rank higher than all others over a given period. It is hence unnecessary for the firm to perfectly observe output. All that is required informationally is that workers can be correctly ranked. In this theory, incentives are provided to exert effort without the need for any formal contract between worker and firm. Tournament and career concerns theory are similar in this respect. The main difference between tournament and career concerns models is that in the former the nature of the reward and the evaluation procedure are tied purely to the employing firm. There are advantages and disadvantages to this approach. One advantage is that workers often do stay at firms for long periods (see Burgess and Rees, 1997, for the UK and Farber, 1995, for the US) and move up the ranks within a firm according to the jobs that exist at different

levels which, from the perspective of the worker, may be fixed. Gibbs and Hendricks (1997) showed, using data from a single firm, that wage increases occur more between grades than within a grade. Tournament theory examines how a hierarchical wage structure may be set up to provide incentives in this context. Career concerns theory ignores the aspect of a firm's hierarchy. A disadvantage of tournament theory, however, is that it ignores the fact that the external labour market also provides incentives for workers. Lazear and Rosen (1981) is the seminal paper on tournaments. They show that larger wage gaps between ranks induce more effort and more risk taking and that there exists a wage gap that induces first-best effort. In a multi-period tournament wage gaps are predicted to be larger at the top; there ought to be increasing returns to promotion up the hierarchy within a firm.

There is a sizeable empirical literature testing the predictions and assumptions of tournament theory. The first part of this literature asks whether tournaments do actually provide incentives in the way the theory suggests. Ehrenberg and Bognanno (1990) investigate whether players' performance in the 1987 European PGA golf series is affected by the level and structure of prizes in individual tournaments. They find that golfers' performances do vary positively with the marginal return to effort. This evidence is found both within a tournament, by looking at the efforts in relation to their starting position in the final round, and between tournaments, by looking at the overall level of prizes. Becker and Huselid (1992) verify this result using data on professional NASCAR racing drivers. Here risk-taking is also shown to occur more for higher absolute prize differentials.

Evidence supporting tournament theory has also been found within firms. Knoeber and Thurman (1985) use a unique dataset on a set of broiler chicken producers between 1981 and 1985 over a period when four different reward structures were used. One of these was a tournament model whereby producers were ranked and paid according to their rank (performance was measured by the weight of the chicks conditional on their feed). The results confirm the predictions from tournament theory. Baker Gibbs and Holmstrom (1994a) use very detailed personnel data on a single firm and find, as predicted, that the relationship between salary and level in the hierarchy is strongly convex. On a much larger scale, Lambert, Larcker and Weigelt (1993) distinguish 4

hierarchical levels for each of 300 firms from plant manager to CEO. The inter-rank spread of compensation increases up the hierarchy in this sample. Main, O'Reilly and Wade (1993) examine the reward structure of executives in 200 large organisations. They also verify the increasing returns to promotion up the hierarchy. Another prediction from tournament theory is that the reward ought to increase with the number of competitors. Main, O'Reilly and Wade (1993) also find that the return to promotion from vice-president to CEO is positively correlated with the number of vice-presidents in the firm.

Holmstrom (1982a) showed that relative performance evaluation, as used by tournament theory, is valuable purely as a signal which transmits performance information. Competition is not valuable *per se*. In fact, as Lazear (1989) points out, it may suppress helping effort and even lead to employees sabotaging each other's work. Drago and Garvey (1997) provide evidence from the Australian manufacturing sector that where promotion incentives are reported to be strong, workers are less likely to let others use their equipment, tools or machinery. Piece rates and share schemes, on the other hand, are insignificantly related to this helping effort.

An alternative view of the promotion system is that it acts as a mechanism for the firm to sort workers into jobs according to their talent. A further exploration of sequential promotion contests (Meyer, 1992; Rosenbaum, 1979) including workers of heterogeneous talent has led to the prediction of a fast track for talented workers. According to Rosenbaum, firms design their promotion system as a tournament - a series of implicit contests for promotion which progressively differentiate a cohort of employees throughout their careers. Such a system provides incentives to all workers throughout their careers. This model predicts that for persons achieving a given hierarchical position, the path by which they arrived there affects their progression from that point. This is the path dependence hypothesis. In particular, it is hypothesised that an early promotion has a durable effect on further promotion chances. Bruderl, Diekmann and Preisendorfer (1991) find evidence supporting this hypothesis using data from a single firm's personnel records over 9 years. Baker Gibbs and Holmstrom (1994a,b) also provide evidence of fast tracks of promotion within a large firm. They also show that it is those that experience fast wage growth within a grade that are

likely to be promoted quickly. This suggests an underlying variable such as ability that is the determinant of both wage increases and promotions. Several models explicitly isolate the sorting aspect of the promotion process (e.g. Rosen 1982) however, they are not elaborated on here as the focus is intended to be directed purely towards worker incentives. Prendergast (1999) notes that there is little work that combines the two approaches.

Overall, the evidence strongly suggests that tournaments do provide incentives as predicted, although it has to be said that much of this evidence comes from sports rather than business. The return to promotion does increase up the hierarchy and there is some evidence that higher rewards are offered when there are more competitors. The use of the promotion system is also a mechanism to sort workers into jobs as well as to provide incentives. Given that workers are heterogeneous in talent and that workers may be able to influence the firm's belief about their talent through exerting effort, as described in the career concerns literature, the structure of hierarchical compensation would seem to be an extremely important aspect of the firm's incentive structure.

(c) Deferred compensation

Finally we consider the issue of upward sloping wage profiles. There has been much controversy over the degree to which this reflects experience or tenure (see for example, Altonji and Shakotko, 1987; Topel, 1991; Topel and Ward, 1992 and Altonji and Williams, 1997). Leaving that literature to one side, there are a number of interpretations of any relationship between wages and tenure. The simplest and oldest is that it reflects the accumulation of human capital. An alternative idea is that arises as an equilibrium phenomenon in a search and matching environment.

Thirdly, it could be an incentive mechanism, a dynamic efficiency wage argument. Lazear (1981) argues that such deferred compensation is a mechanism which provides incentives to workers early in their careers to exert effort in order not to be sacked and hence lose the pay-off owing to them later in their tenure. Lazear and Moore (1986) test an implication of this model which is that self-employed persons ought to have flatter earnings profiles than those working in firms since their are no agency

considerations for the self employed. They find support for this proposition. Chang and Miller (1996) also find support using Australian household data. An alternative test of this model is to ask whether the slope of the age-earnings profile affects productivity. Van Audenrode and Leonard find strong support for this hypothesis using Linked Employer-Employee Data (LEED) for a large sample of Belgian firms. They also find evidence, however, that deferred compensation may be used as a mechanism to reduce turnover. Profile steepness is found to be strongly negatively correlated with employee turnover.

Freeman and Medoff (1984) and Spilerman (1986) also show that firms often build explicit seniority provisions into their pay, promotion and retention decisions independent of productivity. One answer to this apparent contradiction to economic theory is that such rules provide a second best alternative to the biases that are introduced by performance related pay and promotions. Firms could also be providing insurance to risk averse workers by such provisions or setting their wage structures to reduce costly turnover (e.g. Stevens, 1999).

(d) Conclusions on careers

There is generally less evidence on the dynamic models:

- While we do know from other literature that many workers move from one job to another in search of higher pay, and that promotions are common. there is very little direct evidence on the predictions of the career concerns model

- There is more evidence on tournament theory, and what there is does generally support the theory; convex reward structures appear to predominate, and they do appear to produce more effort (though the latter point is largely only tested in a sporting context).

4. Conclusion

There has been a great deal of theoretical work in recent times on the appropriate structure of incentives in organisations. As Gibbons (1998) notes, this has moved away

from the classic incentives-insurance trade-off to much more interesting issues that relate more closely to recognisable incentive schemes in business and government. There has been less empirical work, and even less empirical work on individuals other than CEOs. Prendergast (1999) highlights the substantial gap in the empirical evidence relating to people whose work is hard to measure, and whose pay is often determined by their superiors. Furthermore, there is very little evidence relating to the provision of or effects of incentives in the public sector.

This survey has tried to pull together some strands of this literature with relevance to issues in the public sector. Noting the caveats just expressed, the main findings (and key references) are as follows:

- Workers react in significant ways to incentive schemes (Lazear, 1996); productivity gains come from both greater effort and the attraction of better workers.

- Workers react in sophisticated ways, manipulating the quality or timing of what they do (Courty and Marschke, 1997)

- Workers react in ways that may not be what the organisation intended (Kerr, 1975). This implies the need for careful design of such schemes.

- Detailed studies on firms show that they are able to choose the method of payment in sophisticated ways (Paarsch and Shearer, 1997)

- Broad-based cross-sectional studies show that the pattern of existence of different types of schemes is roughly in accord with theory relating to measurement and multi-tasking (Burgess and Metcalfe, 1999).

- We know that some public sector workers are motivated by more than just their own income (Heckman, Taber and Smith, 1996). We do not know that private sector workers are not so motivated.

In addition to echoing Prendergast's plea for more empirical work on non-CEOs, we want to highlight a number of big unanswered questions relating specifically to the public sector. While it seems clear that some form of altruistic behaviour was involved in the JTPA outcomes as analysed by Heckman et al, it seems unlikely that public

sector workers simply have different utility functions from private sector workers. It may be that they would also respond to some incentive scheme that gave the rewards to charity. Or it could be that altruistic public-spirited people are self-selected into the public sector, so that they do, in equilibrium, have different utility functions. This, too, has implications for appropriate incentive design.

We do not understand the inter-connections between incentive schemes and the job security typically enjoyed by public sector workers. We do not understand the trade-off between incentive schemes and the need for proper behaviour by public servants. We do not have a fully worked out view of the link between incentive schemes and the lack of competition for the output of many public sector workers. Finally, we do not have a very good understanding, either theoretically or empirically, of the role of incentives for teams. This seems to characterise the work of many in the public sector (and the private sector).

Appendix

Article	Description
Abowd (1990)	• Investigates whether the sensitivity of managerial compensation to corporate performance in one year is positively related to corporate performance in the next year. • Data: 16000+ managers at 250 large corporations from 1981 to 1986 • Accounting-based measures of performance give only weak evidence of a correlation • Economic and market measures of performance imply a significant positive correlation
Abraham and Farber (1987)	• Argues that the measured cross-sectional return to seniority is largely a statistical artefact due to the correlation of seniority with some omitted variable representing worker quality. job quality or worker-job match quality and hence earnings do not, in fact, rise very much due to seniority alone. • Uses Panel Study of Income Dynamics data • Estimates an earnings function with pre-job experience, the square of pre-job experience and the residual from a regression of seniority on completed job duration as instruments for total experience, square of total experience and seniority respectively • This IV regression yields results that suggest a much lower return to seniority than standard OLS estimates.
Acemoglu and Pischke (1996)	• Constructs and tests a model of training within firms which, in contrast to Beckerian human capital model, suggests that firms pay for general training due to the fact that firms gain superior information about workers' ability relative to other firms and can therefore exercise ex-post monopsony power over the worker and hence extract rent from general as well as firm-specific training. • Uses 2 cross-sections of the German "Qualification and Career Survey" in 1979 and 1985/86, each sampling approximately 30,000 employed workers aged 15-65. The sample used only includes full time male workers who undertook an apprenticeship and did not obtain any higher school-based education and are aged 23-59. • The model assumes that firms choose their optimal level of training, (which is less than the efficient level) and at the end of this period are fully aware of the workers' ability. They then decide who to sack and who to keep. Those who quit voluntarily are assumed to be indistinguishable from those who are sacked. An optimal wage is set for those who stay which is less than the workers' marginal product but which still induces the workers to stay. A positive wage is paid during training as an ex-ante premium on the monopsony power that the training period gives them in terms of learning workers' ability. • A prediction of the model is that those who quit should receive a lower wage than those who stay and that those who leave for compulsory military service should receive a higher wage than those who leave for other reasons. Turnover ought also to be negatively related to the level of training and multiple training-turnover equilibria are possible. • Key results: 1. Following the apprenticeship, the wages of those who stay with the firm and those who leave for military service are significantly higher than for those who quit. 2. Those who leave for military service have slightly higher wages than those who stay. Even though stayers should have strictly higher ability on average, this is explained by the model as being a result of the firm extracting rent from the training given whereas military quitters can extract their full marginal product from their next firm. 3. Germany can be seen to be a high training-low turnover country while US is a low training-high turnover country. (The number of different jobs a worker has in Germany during his career is far less than in US) This is explained as a

	result of the high hiring and firing costs in Germany relative to US and as such a higher value is placed on screening information.
Altonji and Shakotko (1987)	• Argues that the observed pattern of wages increasing with seniority is largely a statistical artefact due to the omission of a variable representing worker quality, and worker-job match quality. Heterogeneity in the labour force with respect to this variable is said to lead to the observed wage-tenure profile. • Uses a similar analysis to Abraham and Farber (1987): Panel Study of Income Dynamics data is used . • To account for the omitted variable bias, deviations of the tenure variables from their means are employed as instruments for tenure and are, by construction, uncorrelated with the individual specific error component of the wage equation and with the permanent job match component. • Key results: 1. IV estimates imply that accumulation of the first 10 years of tenure results in a wage increase of only 2.7%. This is approximately 1/11th of the OLS estimate. (Alternative specifications lead to results of up to 6.6% but are still much lower than OLS) 2. The estimate of the contribution of total labour market experience to wage growth over the first ten years is 53.7% and, over 30 years, 86.6%. The corresponding OLS estimates are 31.7% and 48.2% respectively • Conclusion: Tenure plays only a modest role in wage growth with general labour market experience accounting for the most part.
Antle and Smith (1986)	• Investigates the extent to which CEOs are paid subject to relative performance evaluation. • Sample includes top-paid 3 executives from 39 firms between 1947 and 1977. All forms of compensation are included (stock options, pension benefits etc) • Firm performance is split into 'systematic' and 'unsystematic' components reflecting market and firm-specific performance respectively for two different performance measures, Return On Assets (ROA) and RETurn on common stock (RET). [ie we have SROA, UROA, SRET and URET] • Holmstrom's theory predicts that executive compensation ought to be correlated with the firm-specific component of performance but that contracts ought to filter out the common risk associated with the systematic component and so no such correlation should here be found. • Key results: 1. For only 16 out of 39 firms are the coefficients on UROA and URET significantly different to those on SROA and SRET. 2. Out of these 16, $B_{UROA} - B_{SROA}$ is significantly positive for 6 at the 5% level (none significantly negative) and $B_{URET} - B_{SRET}$ is significantly positive for 7 (none significantly negative). • Results therefore slightly support relative performance evaluation with some evidence being found that executive compensation filters out market fluctuations to reward firm-specific performance. This evidence seems very limited though.
Asch (1990)	• Examines how Navy recruiters in April-August 1986 reacted to a multi-period incentive plan that included piece rates, quotas, prizes and standards. • Results show that productivity is highest in the period immediately prior to the quota/prize cut-off date and lowest immediately afterwards and that average quality of recruits falls as cut-off approaches.
Baker, Gibbs and Holmstrom (1994a)	• Case-study analysing 20 years of personnel records for all management employees in 1 medium-sized US service-sector firm. • Data set contains ID no., age, sex, race, education, job title (= level 1-8), cost centre description, cost centre code, salary, bonus, salary grade and performance rating for each employee at 31st Dec. each year (1969-1988)

	• Key results: 1. Stable hierarchical structure 2. No evidence of specific ports of entry or exit (except for entry at the lowest level.) 3. Variance of level attainment after 10 years for those employees entering level 3 between 1970 and 1979 is significantly greater for new employees than for those promoted from lower levels. ie. career patterns are more variable for new hires than for incumbents, hence evidence supporting the Learning hypothesis 4. Evidence of fast-tracks of promotion and exit; those promoted quicker from level 1-2 are more likely to be promoted quicker again and also more likely to leave the firm 5. Relationship between salary and level is strongly convex
Baker, Gibbs and Holmstrom (1994b)	• Same data set as above • Graphical evidence shows that, without exception, those employees experiencing faster wage growth within a level are more likely to be promoted sooner. Based on this, it seems most likely that both promotions and wage increases are determined by an underlying variable, ie ability. • There are a substantial number of individuals who experience real wage declines. • Entry wages are significantly influenced by external market conditions and the wage profile of each year's entry cohort reveals marked persistence. ie w_t depends on w_0. • Despite differences in wages across entry cohorts, promotion performance is the same. • Concludes that there is evidence in this data set to support learning, human capital and incentive models of wage determination.
Barron, Black and Loewenstein (1989)	• Examines the impact of on-the-job training on starting wages, wage growth, productivity growth and employer hiring standards • Data: Survey of 2625 employers in various industries and locations across USA. Includes breakdown of training into specific types, education, age, sex, relevant experience and union variables. Also includes wages and employer estimated productivity for the first 3 months and for after 2 years. • Key results: 1. During the first 3 months, 30% of an employee's time on average is spent training. 2. * Training and starting wages are uncorrelated. (Presumably because the negative effect that workers share training costs and the positive effect that higher ability workers receive more training cancel each other out.) 3. Training and wage growth are positively correlated (10% increase in training leads to 1.5% increase in wage growth rate) 4. Relevant experience has a negative effect on wage growth 5. Training and productivity growth are positively correlated (10% increase in training leads to 3% increase in productivity growth rate) 6. When filling positions with more training involved, employers spend more time per applicant on the screening process and see more applicants on average
Beaudry and DiNardo (1991)	• Uses Panel Study of Income Dynamics to test their theory that wage determination is more consistent with a contract approach than with a spot market approach. • Controlling for education, experience, tenure, industry, region, race, sex, union status and marriage it is robustly found that past labour market conditions (as measured in a variety of ways) significantly affect wages even when contemporaneous conditions are controlled for and that conversely, controlling for the best labour market conditions since the start of the job, contemporaneous conditions are no longer significant. • This result is consistent with BGH(1994b), showing that there is a strong degree of persistence in initial wages, characteristic of a shielded internal labour market.

Becker and Huselid (1992)	• Examines the effects of different reward levels and structures on the performance of motor-racing drivers. • Panel data collected on two classes of auto races for drivers who participated in at least 5 races in their class for the 1990 season. • Key results: 1. Increasing the absolute spread of prizes improves driver performance and decreases safety. 2. Only limited evidence that relative prize spread has the same effect.
Black and Lynch (1997)	• Examines the effect on worker productivity of Human Resource Management (HRM) practices. (and computers) • Data is from 1994 Educational Quality of the Workforce National Employers Survey and Longitudinal Research Database. Sample contains lots of information about 627 private establishments with more than 20 employees between 1987 and 1993. • Results: 1. Implementing individual HRM practices insignificantly influences productivity 2. Combining PRP/Profit sharing with practices giving employees a stronger voice improves productivity. Unionisation with incentive based pay and joint managerial-worker decision making boosts productivity but unionisation with traditional labour management relations has a negative effect.
Booth and Frank (1997)	• Uses BHPS data on individual employees to estimate the productivity gains (proxied by earnings) of switching to PRP. Note: 37% male and 23% female employees in sample are on some form of PRP • Key results: 1. PRP raises earnings by 9% for men and 6% for women over the entire sample 2. The return is slightly lower for unionised firms (5% and 7%), but union firms are more likely to be covered by PRP.
Brown and Philips (1986)	• Analyses the Californian canneries industry between 1890 and 1960 with regard to the transformation of the compensation system employed from piece rates to time rates • Piece rates were used originally as a means to extract as much labour as possible from a limited pool. No pre job screening was necessary and productivity was entirely determined by the worker and output was easily measured. • As production became more mechanised, the opportunity cost of low productivity workers increased but output was still predominantly determined by labour input and hence pre-job screening was introduced but piece rates were still kept as an incentive scheme. • Eventually, production became so mechanised that the main function of workers was to correct machine errors. The pace of production became determined by machine. Time rates were introduced because piece rates would create perverse incentives to cause errors and would not increase production.
Brown, C. (1990)	• Using data from the Bureau of Labor Statistics Industry Wage Survey, firms' choice of method of pay is examined with respect to the firm, worker and job characteristics. • Data distinguishes 10 methods of pay which Brown collapses into 3; Standard Rates, Merit Pay and Piece Rates. 10 industries are analysed • Key results: 1. Larger establishments are more likely to use piece rates 2. Predominantly female establishments are more likely to use piece rates 3. Unionised establishments make significantly greater use of standard rates than do those non-unionised. 4. Incentive pay is less likely in those jobs with a variety of duties than those with a narrow set of routinised duties. 5. The ease of monitoring work quality is correlated with the use of incentive pay • NEP theory broadly verified by the above, but:

	6. Occupational dispersion, capital intensity and rapid growth in value-added per employee are not significantly negatively related to the use of piece rates
Brown, C. (1992)	• Tests the hypothesis that wages ought to increase in line with the amount that pay is linked to performance. • Using data from Bureau of Labor Statistics Industry Wage Survey on over 3000 establishments, the unexpected result is found that merit pay workers actually receive lower wages on average than do those on time rates. This result is robust to a number of different regression specifications • There is no satisfactory explanation for this result and, as such, it remains a challenge for future research.
Brown, J. (1989)	• Uses Panel Survey of Income Dynamics (1976-84) to argue that wages represent contemporaneous productivity and not contractual considerations. • Data includes answers to the question: "How long would it take for a new employee to be trained to do your job?" Using this and corresponding data on tenure the contemporaneous effect of training on wages is isolated. • Training is used as a proxy for productivity growth such that contemporaneous wage growth ought to occur most significantly during periods of training. A measure is also used to account for prior training and experience in order to accommodate the expected concavity of the wage-skills profile. Pure tenure effects on wages are accounted for by a quadratic age-earnings specification and 4 dummies representing the individual effects of the first four years in the job. • Key results: 1. 1 year training yields 22% cumulative training-related wage growth; 2-5 years yields 30-35%; 6 years 18%; 7 years 10%; 8 years 4% 2. Once a variable is included to account for promotion prospects due to contemporaneous skill acquisition, pure tenure effects reduce to insignificant proportions. • Concludes that wages increase with tenure primarily because productivity does also and that contractual factors play no major role.
Bruderl, Diekmann and Preisendorfer	• Uses data on workers' personnel records from a large German manufacturing firm (1976-1984) to test the predictions of Rosenbaum's tournament model and provide a new improved version. • According to Rosenbaum, firms design their promotion systems as a tournament - a series of implicit competitions for promotion which progressively differentiate a cohort of employees throughout their careers. This construction provides incentives to all workers at all points in their career. • It predicts that for persons achieving a given hierarchical position the path by which they arrived there affects their progression from that point. (*path dependence hypothesis*). • In particular, it is hypothesised that an early promotion has a durable effect on further promotion chances (*early promotion hypothesis*). Those promoted relatively early have more favourable career prospects. • The workforce of the firm is arranged into 7 hierarchical levels (L1-L7) from unqualified workers to leaders of groups. • The unit of analysis is the amount of time spent at a particular hierarchical level for those who ended up being promoted. There are 5422 such episodes in the panel. • At each level (2-4) those employees promoted from the level below the previous year are separated and the proportion promoted within a year for both groups is calculated. • Early promotion hypothesis is refuted by the results. (χ^2 test) • An adjustment is made to the early promotion hypothesis to account for tournament level effect (different levels have different promotion opportunities) such that the modified early promotion hypothesis reads: Those promoted to level 2 in period 1 are more likely to be promoted to level 3 in period 2 than those promoted to level 2 in period 2 are likely to be promoted to level 3 in period 3.

	• The above thesis is strongly supported by the data. • An event history analysis is next used to test the same proposition. The results are confirmed: Those promoted early have better career prospects.
Chang and Miller (1996)	• Tests the prediction of the Lazear and Moore model that the present value of lifetime earnings should increase with the slope of the age-earnings profile more for wage and salary earners than for the self-employed. This prediction arises because the slope of the age-earnings profile determines the power of the incentives facing salaried workers to input effort such that a steeper slope raises lifetime productivity and hence lifetime earnings. There are no agency issues for the self-employed and, as such, the slope of the age earnings profile is not a measure of the power of incentives. • Uses data from 1991 Australian Census Household Sample File and samples 20-64 year-old males who work at least 35hrs/week. Dataset includes schooling, qualifications, occupation and income and holds 18,551 observations. • The data is divided into 8 occupation groups. The present value of lifetime earnings (PV) and the slope of the age-earnings profile (slope) is calculated for each group for self employed and salaried workers. PV is regressed against slope for salaried and self employed. • Key results: 1. The slope coefficient is positive and significant for salaried and insignificant for self-employed. • Overall, findings perfectly consistent with Lazear + Moore.
Chevalier and Ellison (1997c)	• Uses data on mutual fund managers to examine whether career concerns cause younger managers to behave differently to older ones. • Probability of a young manager keeping his job appears to be a concave function of excess returns. For an older manager the relationship is fairly flat. • Measures of boldness of a manager's action in a given year are regressed onto his age (and several control variables) • In all cases, the coefficient on age is significantly positive at the 5% level. ie younger managers have less risky portfolios than older ones.
Chiaporri, Salanie and Valentin (1998)	• Considers a class of models characterised by two features: 1. Learning 2. Downward rigidity • Theory shows that, controlling for wages at time t, wages at t+1 should be negatively correlated with wages at t-1. • Data used is a sample of 1000 executives of a French state-owned firm over 15 years. Career paths are traced using a hierarchical structure of 4 discreet levels up which executives are promoted at different stages in their career. • Periods are defined with respect to keeping the size of the promotion and non-promotion groups reasonably similar. • Results support the theory:
Coughlin and Narasimhan (1992)	• Uses data from a survey of 286 firms on salesforce compensation to examine the impact of several variables on total pay and the ratio of salary/total pay. • Uses OLS for total and double limit Tobit model for the ratio • Key results: 1. Compensation gets more heavily weighted towards salary with years of service, educational attainment and the sales/call ratio. 2. Incentive component increases with average number of calls to close a sale.
Courty and Marschke (1999)	• Examines how the incentive structure of the JPTA programme affects the way in which programme administrators report outcomes. • Uses National JTPA Study data from 1987-1989. Includes data on 16/620 JTPA centres, their incentive structures and reported outcomes. Also included are detailed

	data on participants. • The administrator is awarded a bonus if an annual target is met for employment of her programme participants. She can report a particular participant's employment status (and hence terminate the participant from the records) at any point between the end of training and 90 days thereafter. • Simple models are constructed predicting the reporting date relative to the end of training within the year and at the year end. It is predicted that reporting will take place as soon as the participant is employed or after 90 days whichever comes first. At the end of the year the proportion of participants reported immediately prior to the year end depends on how well the centre has performed throughout the year relative to its target. • The predictions from these models are reasonably well verified by the data. Specifically it is shown that reported performance is approximately 20% higher than if outcomes were all recorded immediately after programme completion. • It is also shown that such reporting behaviour is consistent with gaming and not with increasing human capital of participants through informal help and advice during the job search. 18 months of post-training earnings of participants unemployed at the time of reporting whose termination has been delayed are compared with those whose termination has not been delayed. Holding participants' characteristics constant, the point estimate of the average effect of termination delay is negative and insignificant. Reporting behaviour thus does not increase earnings. • There is also a cost to keeping track of participants and hence the gaming response to performance incentives is inefficient • This problem is not solely due to the measurement rule of 0-90 days since it is efficient to allow training centres flexibility in the length of training of participants and so a fixed date for reporting would thereby give an incentive to vary the length of training for gaming reasons. • It is argued that the existing incentive structure also provides incentives not only to cream-skim, as many others have argued, but also to only offer *rapid attachment* activities such as interview workshops rather than intermediate training such as a remedial language skills training which serves as a stepping stone to further training. ie it is optimal for the centre to select applicants at the end of their pre-job schooling/training.
Cragg (1997)	• Tests the JTPA for evidence of cream-skimming. • Data from 1983-87 period. • Estimates a probit model of the probability that an eligible individual is enrolled into the JTPA programme based on whether the individual was a welfare recipient, a high school dropout, sex, race and 2 age dummies. • This first model shows that high school graduates, welfare recipients and non-whites were more likely to be accepted • Additional regressions show that enrolment is more likely to be biased towards those with labour market experience in states with higher unemployment. This is interpreted as evidence of cream-skimming. • Value added is also estimated in terms of before and after earnings and is compared with value added under the Comprehensive Employment and Training Act (CETA) prior to the JTPA. The CETA was not rewarded by performance and hence serves as a control to test the power of the IS in the JTPA. It is found that the JTPA performs better for value added. • Overall, this paper is very similar to Heckmann, Smith and Taber (1996) in its objectives but suffers from selection bias because data used is selected from those eligible for the programme rather than those who actually applied as did HST. More confidence can be given to HST's results suggesting there is no cream-skimming.
Dewatripont, Jewitt and Tirole (1999a)	• Compares information structures between explicit and implicit incentive schemes including the sufficient statistic theorem of Holmstrom (1979) and Shavell (1979) and the impact of a Blackwell garbling of the information system (e.g. Grossman-Hart,

	1983) • Sufficient statistic theorem states that a performance measure z is redundant if y is a sufficient statistic for (y,z) when estimating effort. A Blackwell garbling, such that the distribution of the likelihood ratio incurs a mean preserving spread, raises agency costs. • Results: 1. An agents implicit incentives are not altered when only a sufficient statistic for the signal vector is disclosed 2. Given signal vectors (y,z), disclosing only y reduces marginal incentives if signals z and efforts are similarly ordered. The converse is also true: disclosing only y increases marginal incentives if signals z and effort are oppositely ordered Similar ordering of z and effort obtains either when z is good news for talent conditional on y and efforts increase z conditional on y, or when z is bad news about talent conditional on y and efforts decrease z conditional on y.
Dewatripont, Jewitt and Tirole (1999b)	• Uses multitask career concern model to analyse the incentives of government agency officials. • Wilson stresses 3 key differences between government agencies and the private sector: 1. Preponderance of career concerns over financial incentives 2. Multiplicity and fuzziness of objectives 3. Limited autonomy • What is considered important for government agencies to succeed is: • Mission setting • Focus • Substituting professionals for bureaucrats Results: 1. Expanding the set of tasks pursued by the agent typically reduces total effort. This is because the link from performance to the markets inference about talent becomes weaker 2. Uncertainty over the nature of tasks pursued or the effort allocation between tasks reduces incentives again, because of a weakened link from performance to talent inference. (market is infering task concentration as well as talent) 3. Above two results imply that a narrow specialist/professional can be relied on to exert more effort and can hence be given more autonomy. • A “fuzzy mission” is such that the market learns about the mission throught the vector of performance signals. The distinction between clear and fuzzy missions is technically similar to that between pure and mixed strategy equilibria. • In a multitask context in which the information about task performance cannot be suppressed, the agent may be too dispersed. To restore focus, the principal may wish to hire a narrow specialist.Suppose that there are two tasks and the principal can monitor the agent at cost k. Hiring professionals who have zero productivity on one task means that the monitoring cost need not be incurred as it would were two bureaucrats to be hired. Professionals are more likely to be hired when there is little uncertainty over the organisations goals. Where there is uncertainty, one task may turn out to be the more valuable and the bureaucrat is better placed to be able to transfer effort across tasks. • The positive correlation between effort and talent risk in career concern models, a feature which is reversed in explicit incentive models, is a key insight that helps us to understand the importance that scholars like Wilson have given to “focus” in explaining government agencies’ performance.
Dixit (1997)	• Builds on Holmstrom and Milgrom(1991) model to the case when there are several principals as may be thought to be the case for workers in government bureaucracies. • Where principals collude to provide an agreed incentive contract for the employee, the result is the same as H+M, namely that multi-dimensional efforts and outputs interact to weaken incentives.

	• Here, this result is taken as given and, instead, the effect of non-collusive principals is investigated. • In the first stage of the game, principals choose a linear incentive scheme. Ine the second stage the agent chooses his optimal action given the aggregate incentives he faces. • Results: 1. Theproblems of multi-tasking are magnified by the number of principals. • Conclusions: 1. Public sector less likely to offer PRP and be more likely to be governed by strict rules - ie. more bureaucratic. 2. Stakeholder society will incur efficiency losses owing to the need to satisfy multiple principals.
Drago and Garvey (1998)	• Develops and tests a model of how commonly used incentive schemes (including promotion) affect workers' propensity to help one another • Data: 1988 survey of 23 Australian workplaces (2066 workers, 40.6% response) Sample is unintentionally skewed towards manufacturing employees and final sample is 569 workers in 82 workgroups of size between 2 and 80 • Key results: 1. Piece rate and Share scheme are negatively (but insignificantly) related to helping effort 2. Prize (formulated on tournament theory predictions) is negatively and significantly related to helping effort. 3. Task variety coefficient is positive and significant • Conclusion: Promotion incentives are of greater significance than PRP in influencing helping effort and other studies which ignore them may be introducing bias into their results.
Drago and Heywood (1995)	• Tests NEP predictions on Australian Workplace Industrial Relations Survey. Data sample includes 1165 workplaces • Considers the determinants of incentive schemes. Hypotheses are divided into: I. Worker effort monitoring II. Product quality III. Job security/tenure IV. Competition V. Industrial relations climate • A probit specification is used with each of 5 different incentive schemes as the dependent variable: i. Individual piece rates ii. Group incentives iii. Workplace level incentive schemes iv. Higher than workplace level incentive schemes v. Profit sharing • Key results: 1. Employment is significantly positively correlated with piece rates, group incentives and higher than workplace level schemes. (others insignificant) 2. The proportion of managers is significantly positively correlated with 4/5 incentive schemes. (group pay insignificant) 3. The proportion of women is significantly positively correlated with piece rates and profit sharing. 4. Unionisation is not significantly correlated with any IS 5. Public sector is significantly negatively correlated with piece rates, group IS and workplace IS. 6. Job insecurity is significantly positively correlated with piece rates, group IS and profit sharing • Conclusions: Results generally consistent with NEP in that increased monitoring costs

	(proxied by size and hierarchy) induce more formal incentives and longer tenure is associated with fewer formal incentive schemes, consistent with tournament theory and the incentives of career progression.
Dustmann and Meghir (1998)	• Investigates the sources of wage growth and, in particular, whether seniority plays a significant part. That is, do wages increase relative to alternatives solely due to sticking with the same firm. • Framework: $\ln w_t = r_t H_{it}$ $= \alpha \ln G_{it} + \gamma \ln S_{it} + m_{ift} + \ln r_t$ where H is human capital and r is its market price. G is general and S is firm-specific human capital; m is the match quality component. • The rate at which individuals collect general human capital is heterogeneous across individuals but constant for each person when employed (0 for unemployed). Innovations to S vary across time, firm and individuals and starts afresh at the beginning of every employment spell with a new firm. • Assumes that individuals search for better matches while on the job, randomly sampling one job offer each period from a distribution of offers and move to a new job when an offer is received which compensates for the loss in accumulated seniority and firm-specific capital. • In order to eliminate from the estimate of returns to tenure the quality of the match which is correlated with tenure, only those workers who have left a firm due to closure are sampled. It is assumed that these workers act as though they were unemployed. By so doing, returns to tenure as well as experience can be individually identified. • Because workers will probably be aware that the firm is about to close, workers are sampled if they left within 2 years prior to the closure. There is a problem with this, in that the workers may have more time to search for a good new job than if they were unemployed and hence search capital is not perfectly stripped out of the estimation. The estimates are not much different though when the period is 1 year prior to closure. • Data: 1% sample from German Social Security records including complete accurate data on earnings, employer and background variables, supplemented by information from the official unemployment records from 1975-1990. Firm size is also included between 1981 and 1990. • OLS regression, Topel's regression and DM's regressions are run and compared. • Key results: 1. There is substantial mobility among young workers in Germany and job shopping does lead to wage growth as expected. 2. OLS overestimated the returns to experience and tenure. The main source of this bias comes from the fact that individuals self-select themselves into labour market participation according to their returns to experience which are heterogeneous across individuals. Those with a higher return to experience have a stronger labour market attachment and will hence accept a lower wage following closure. Not allowing for this gives the impression of a fall in the wage rate due to losing the return from accumulated tenure at the previous job whereas in fact it is a loss of search capital. DM allow for this effect by introducing an interaction of the residuals with the level of experience when modelling post-closure entry level wages. 3. Best estimate for average returns to experience is 2.7%/year compared with 3.6% for OLS and DM's homogeneous returns regression. (Topel estimate=3.9%) 4. The return to tenure is uncertain but small: co-eff = 0.38, se=2.01 5. Aggregate wage growth ($\Delta \ln r_t$) over the period was, on average, 1.8% per year. • Results imply that wage growth is determined predominantly by the accumulation of general human capital and search capital (finding the best match). Tenure on its own does not significantly affect wage growth. People with consistent labour market participation earn substantially more than others of the same age, training and education who have had spells of non-participation.

Ehrenberg and Bognanno (1990a)	• Investigates whether the level and structure of prizes in golf tournaments (1987 European PGA tour) influences players' performance. • Key results: 1. Those players who had performed well over the first three rounds and were hence in contention for high finishing rank performed relatively better in the final round than did those who had fared worse in the initial rounds. (Marginal earnings increase with improving rank order) 2. Tournaments with higher prizes, (all have similar reward structure), induce better overall scores. Hence: Golfers' performances vary positively with the marginal return to effort. • NB Adjustments were made to the regression in order to control for selection bias with regard to the standard of entry to the tournament.
Encinosa III, Gaynor and Rebitzer (1997)	• Constructs and tests a model of the extent of PRP in compensation contracts that include group norms as well as risk aversion and multi-tasking. • Uses comprehensive data set of medical group practices in 1978 including 957 groups and 6353 physicians altogether. • Key results: 1. Increasing the size of the group has a significant negative influence on the probability of compensation being equally distributed among group members. (Probit estimates) 2. Smaller groups sustain higher effort levels than larger ones when no incentive pay is adopted. 3. Increases in the proportion of pay based on incentives lowers the number of consultations between doctors about patients (these consultations are not rewarded 4. The measure of physician's risk aversion used has a significant positive influence on the probability of compensation being equally distributed among group members • The authors interpret results 1 & 2 as meaning that group norms, which , according to their model, have an effect which diminishes as group size increases, influence the compensation arrangements and the effort levels of group members. Results 3 & 4 are the expected results of standard agency theory with regard to multi-tasking and risk-aversion.
Farber (1994)	• Uses sample of 14160 full-time jobs held by 3776 workers between 1979 and 1988 in the National Longitudinal Survey of Youth to examine mobility patterns. • Key results: 1. Probability of leaving a job rises to a peak at 3 months tenure and monotonically declines thereafter. 2. Substantial heterogeneity in mobility rates amongst young workers, (even controlling for person specific variables), that does not appear to be fixed over time. • Results consistent with learning/job matching model whereby match quality improves with tenure and job change is costly
Fernie and Metcalf (1995)	• Following the conceptual framework of Mahoney and Watson (1993), WIRS 90 is used to test the effects of participation, contingent pay and representation on workplace performance. Public sector firms are deliberately excluded from the analysis because the main questions on productivity were not asked and employees are not eligible for profit sharing and ESOSs. • MW identify 3 forms of workplace governance - Authoritarian, Collective Bargaining and Employee Involvement along a continuum of different levels of co-operation between labour and management. It is hypothesised that moving towards full employee involvement increases workplace performance because: a) Employees generally have more knowledge about their work tasks than do

	their managers and are better placed to undertake action utilising this. b) Employee involvement provides employees with greater intrinsic rewards from work, increasing satisfaction and motivation. c) Increasing the information flow between labour and management also increases mutual trust and commitment. • Key results: 1. Employee involvement, profit sharing and joint consultation committees are significantly positively correlated with productivity (At 1%, 1% and 10% levels respectively) 2. Union recognition is significantly negatively correlated (10% level) 3. Individual performance-pay plans and merit pay are insignificantly correlated. 4. A more authoritarian form of workplace governance surprisingly leads to lower productivity and improved industrial relations.
Fernie and Metcalf (1996)	• Using data on jockeys' pay and performance, 1983-1995, it is shown that the incentive pay scheme whereby jockeys receive 7% of the prize money for their winners elicits much improved performance (controlling for horse quality) over a retainer system which gives jockeys a flat fee for riding for 1 owner. • As a result, the retainer system is fading away. • No statistical tests are performed in this paper.
Fernie and Metcalf (1998)	• Characterises IS in four organisations: A bookmaker (BM), an (ex-civil service) executive agency (EA), a contracted-out (from local authority) unit collecting parking fines (PK) and the advertising section of a daily newspaper (AD) • The tasks involved in each workplace are quite similar. But BM and AD are private sector, EA and PK are market-tested public services. • EA and BM have ISO9000(excellent customer service), EA also has Investors in People(excellent staff development). • Data collected via questionnaire, interview and observation of working methods • Predictions of NEP and BIS are contrasted and examined with regard to the use of PRP versus time-rate compensation systems. (See theory.doc for summary of NEP) • Basic Results: 1. BM make virtually no use of PRP 2. EA makes modest use of PRP 3. PK has a team-based PRP system. 4. AD has highest PRP:basic ratio of 0.53. Also has a 1/3 team PRP component. • Notes: 1. PK work is individualistic and performance is known to supervisors but not ot other workers and it is hence surprising that PRP is team based rather than individual based. Free-rider problem is confronted by monitoring not peer pressure. 2. Although work is predominantly individual based at AD, team component ensures that experienced colleagues assist new recruits. Bonus is also only paid if >91.5% target is achieved , level of bonus rises rapidly thereafter. 3. BM is not unique amongst bookies. Other bookies were visited and it was found that these cashiers were also paid time rates. • Testing NEP predictions: 1. BM result accords with the NEP prediction in that the span of managerial control is small. 2. Monitoring input and measuring output is cheap in all other 3 (computer telephony) organisations. Output is more important at AD however (principal source of firm revenue) than EA where job is intermediary to revenue generation. Targets are set accordingly. 3. The team based PRP at PK cannot be explained by NEP. 4. At EA, labour is more homogenous. The recruitment procedure specifies

	GCSE requirements wheras at AD, the high powered incentives are deliberately used as a sorting device. 5. Tenure is not negatively correlated with PRP as NEP predicts. In fact, the longest tenures are at AD and the shortest are at BM. 6. Consistent with NEP, average pay is positively correlated with PRP.
Flabbi and Ichino (1998)	• Repeats analysis of Medoff and Abraham (1980) in investigating how much of the observed age-earnings relationship is attributable to productivity but uses absenteeism and misconduct as well as supervisors' evaluations as measures of (non-) productivity. • Uses LEED on employees of a large Italian bank between 1974 and 1994. Contains information on employee characteristics independent of firm including previous work experience. • Key result: Measures of productivity explain hardly any of the increase in earnings that comes with age. Hence productivity is not the driving force for this relationship.
Freeman and Kleiner (1998) "The Last American Shoe Manufacturers: Changing the Method of Pay to survive Foreign Competition"	• Uses longitudinal data on Bigfoot firm to explain why during 70s to 90s most US shoe manufacturers switched from piece rates to time rates as a survival strategy in the face of foreign competition. • Switch was part of a larger move towards continuous flow production with job rotation and small inventories. • Productivity per worker reduced but offsetting cost savings of lower hourly wages, lower monitoring costs and increased flexibility allowed new styles to be introduced quicker • Key point is the transaction cost of updating a piece rate system in a climate of continuous change. Time rates preferred to outdated piece rates preferred to continually updated piece rates.
Garen (1994)	• Examines whether CEO compensation is consistent with the principal-agent model. ie. To what extent is CEO pay linked to firm performance and the variance of firm performance. • Uses Compustat data. Sample includes CEOs in 415 corporations • A measure of performance sensitivity is the dependant variable which is modelled as the increment to CEO wealth due to salary, bonus, long-term incentive plans, dismissal probability (tied to firm performance), ownership of stock options and ownership of stock for each $ increase in shareholder wealth. • Key results: 1. CEO age has a significant (at 5%) positive influence, consistent with incentive theory. 2. Total assets have a highly significant negative effect. 3. Variance of returns has a negative effect • The components of CEO compensation are then split up into pay-based incentives and stock-based incentives. Stock based incentives count for 76% of total compensation regardless of total level.
Gaynor and Pauly (1990) "Compensation and productive efficiency in partnerships: Evidence from medical group practice"	• Investigates the determinants of productive efficiency in partnerships by deriving a behavioural production function model based on individual responses to compensation structures and relating it to traditional econometric production frontier modelling literature. • Evidence is drawn from a medical group practice to test their model of the effect of alternative compensation arrangements on productive efficiency. • In the model: • Production function is strictly concave in all inputs and effort increases the marginal productivity of each input. • Equilibrium effort exists where marginal net income product of effort is equal to marginal utility cost of effort. • A measure of technical efficiency is defined as the ratio of observed output to the efficient (maximum effort) output.

	• Compensation contract specifies the proportion, (a), of individually produced net profit that is kept by the worker. (1-a) is the proportion shared. • When (a) is one then optimal effort is expended, however a is chosen by the risk averse group to pool risk efficiently. • Each partner treats the compensation structure as fixed but it is endogenous as far as the group as a whole is concerned. • Dataset includes 6353 physicians practicing within 957 medical group practices. Crucially, an ordered scale [1,10] is available measuring the strength of the link between compensation and productivity as revealed by the pre-pay / fee-for-service combination. • Results: 1. It is found that output is greater where compensation is more directly related to productivity. Specifically, moving from min to max correlation increases output by 28%. 2. The number of members in a group decreases the quantity produced • Conclusion: above 2 results support incentive theory.
Gibbons and Murphy (1990)	• Tests for the existence of Relative Performance Evaluation (RPE) in the compensation contracts and retention /dismissal of CEOs • Data: 1668 CEOs from 1049 corporations from 1974 to 1986 (published in Forbes) • OLS: dln(CEO Pay) = a + b(Shareholder Return) + c(Industry and/or Market Return) • Result: b is significantly positive and c is significantly negative. ie firms reward CEOs based on RPE. • NB CEO Pay here only includes salary and bonus, no other benefits. • Using logistic regressions it is also shown that Shareholder Return is negatively correlated to the probability of dismissal and Industry/Market Return is positively correlated. RPE hence also affects dismissal decisions.
Gibbons and Murphy (1992)	• Constructs and tests a theory of optimal incentive contracts for workers such that pay ought to become more performance related as the worker approaches retirement due to the deterioration of career concerns as a motivator. • Sample includes 6737 CEO year observations • Key results: 1. Pay-performance elasticity increases with proximity to retirement.
Gibbons and Waldman (1998)	• Surveys theoretical literature on careers in organisations focussing on models that address detailed evidence or stylised facts. Includes: 1. Human capital acquisition 2. Job assignment 3. Incentive contracting 4. Efficiency wages 5. Tournaments • Models are applied to outcomes from labor economics literature concerning wage growth in the absence of promotions, promotions used for job assignment, promotions used to provide incentives, and separation. • Also considers HRM topics such as organisation politics, social relations and work practices. • Stylised facts: 1. Long term attachments between workers and firms are important. Hall(1982) found that over 25% of all employees were in jobs that would last 20 years and over 60% were in jobs that would last over 5 years. 2. Wages grow with experience independent of productivity. eg. Medoff and Abraham (1981). 3. Probability of separation declines with tenure.

4. Wages are persistent.

A) THEORETICAL MODELS

Human Capital Acquisition

- Becker(1962,1964): Wage after general training = marginal product at firm and elsewhere so worker must finance it through lower wage during training period. Wage after specific training is less than MP but more than wage before training. Both cost and rewards are shared between worker and firm.
- Hold-up in specific human capital collection due to non-binding contracts and non-co-operative bargaining on how to divide the surplus. Williamson, Grout etc
- Acemoglu and Pischke (1998) show that a firm will in fact pay for general training since they can earn monopsony rents on the worker ex-post owing to superior information about the workers' ability. There is evidence that firms do finance general training and share its rewards.

Job Assignment

- Sattinger (1975) and Rosen (1978) suggest that *comparative advantage* determines job assignment in many settings.

Incentive Contracting

- Classical model: Mirlees (1974,1976) develops moral hazard model emphasizing trade off between risk and incentives.
- RPE: Holmstrom (1982) discusses "Moral Hazard in Teams". The idea discussed is the use of relative performance evaluation as a means of incorporating information about an individual's performance into the signal. It is only useful when there is a noise term that is correlated across individuals. When there is no correlation then RPE is ineffective.
- Measurability: Baker (1992) and Holmstrom and Milgrom (1991) both distinguish between observed performance and actual contribution to firm value.
- Relational contracts: Also called "self-enforcing" or "implicit. These refer to pay/career advancement based on subjective assessment rather than objective measures. Useful to avoid measurement problems but only works if workers trust firm not to renege. Also can lead to biases. (See Prendergast, 1999)
- Multiple schemes: Baker, Gibbons and Murphy (1994) develop model combining relational and explicit incentives. It is shown that employing both types allows the firm to do better than choosing either one or the other. One role of the relational contract is to reduce dysfunctional incentives. One role of the formal contract is to reduce the size of the relational contract bonus that the firm could save by reneging. (ie. it's a commitment thing)
- Efficiency wages: Shapiro and Stiglitz (1984) is the seminal model and focusses heavily on unemployment implications. Creates incentives for effort under imperfect monitoring when the additional wage is enough to induce the worker to exert high effort to avoid the sack which would occur were he to be found shirking.
- Choice: McLeod and Malcomson (1989,1998) show that the choice between performance bonuses and efficiency wages depends on the local labor market conditions. Where there is excess suply, efficiency wages dominate. Firms never use both. McLeod and Parent (1998) find support for this in that the likelihood that a bonus is paid is negatively related to the local unemployment rate. A variety of data sources are used. They also find that the likelihood of objective PRP is negatively correlated with the number of tasks performed in the job. Consistent with Brown (1990) findings.
- Tournaments: Lazear and Rosen (1981) is the seminal model. Incentives are created through promotions being offered as rank-order prizes. Larger wage gaps induce more effort and there exists a wage gap that induces first best effort. It is shown that under risk neutrality, both tournaments and linear objective contracts are equally efficient. Under risk aversion, however, tournaments are superior. Misleading though, since the optimal contract is generally non-linear. In fact, Mookherjee (1984) shows that under

	risk aversion the optimal non-linear contract is superior to the tournament. Advantage of tournaments is that it is not necessary to perfectly observe output, only to be able to rank workers. In a multi-period tournament wage gaps are predicted to be larger at the top which is supported by stylised facts. Meyer (1992) examines sequential tournaments with no elimination. A fast track result is derived. **B) APPLIED MODELS** **Wages and Tenure** • Abraham and Farber (1987) and Altonji and Shakotko (1987) both show that tenure has a minor effect on wage growth. Topel (1991) shows that these estimates are biased downwards and provides new higher estimates. Altonji and Williams (1997) show that Topel's estimates are biased upwards and provide new in-between estimates. This final figure implies that tenure does have a significant effect on wage growth. • Lazear (1981) models deferred compensation as an incentive device. Also Lazear (1979) explains mandatory retirement as part of the same thing. • Salop and Salop (1976) suggest that firms use a sloped wage schedule to sort workers according to their probability of quitting. A training cost is paid at the beginning by the firm which makes it in the firm's interest to hire workers with a low probability of quitting. Assumes that firms can contractually commit to a wage policy. **Promotions** • Promotions serve as assignment and incentive mechanisms. Prendergast (1992) shows that promotions create incentives to invest in human capital acquisition. If the firm can commit to the existence of jobs then the hold-up problem of under-investment in specific human capital can be ameliorated. It is necessary for there to be different ranked jobs paying wages that are separated by more than the cost of specific HC acquisition. **HRM, Organisation Theory and Career Concerns** • Holmstrom's (1982) career concerns model shows that managerial effort is higher when firms have more uncertainty over ability because performance influences beliefs. Because more observations reduce uncertainty, the manager's effort reduces to zero as the manager ages. • Milgrom and Roberts (1988) show that where possible, young workers bias efforts towards activities making them appear more suitable for future "key" jobs. This can be inefficient. • Politics: Where there is a principal-supervisor-agent relationship, the possibility of side-contracting between supervisor and agent reduces the principal's payoff. Currying favour with one's supervisor and inefficient job assignment / bonuses result. • Social relations: Alchian and Demsetz argued that profit sharing would have no effect on motivation because of the free-rider problem. Supporting evidence in Gaynor and Pauly (1990) for medical group practices and Leibowitz and Tollison (1980) for law practices. Kandel and Lazear (1992) model peer pressure as an argument in the representative agent's utility function. Sources of peer pressure discussed include guilt, shame, group norms and mutual monitoring. Rotemberg (1994) alternatively models altruism in worker's utility. If workers are altruistic and compensation is based on a group measure then equilibrium effort is higher than predicted by individualist agency theory. If one worker chooses a positive level of altruism then that worker's effort will be higher, which, in turn, induces higher effort from co-workers (because of complementarity), so choosing to be somewhat altruistic maximises the origincal worker's income. **CONCLUSION** • There is not yet a cohesive theory explaining all the observed evidence.
Gibbs (1995)	• Uses same dataset as BGH(1994a/b) to examine the promotion-based and within job

	incentive structures and their effect on managers. • Key results: 1. Performance declines with years spent at the same level. 2. There is no evidence that the firm increases the pay-performance sensitivity for those managers who are passed over for promotion. • The data is described in a similar fashion to BGH(1994a/b) and similar conclusions are drawn. The above results indicate, however, that promotion incentives are the most powerful influence on performance.
Gibbs and Hendricks (1997)	• Using 4.5 years of personnel data from 1 large US firm, the real effects of formal compensation policies are examined. • The firm employs a strict salary range for each job and employees are not given nominal pay cuts. Pay rises are performance related and are weighted towards those whose pay is lower in the range. That is, for a given performance rating, an employee lower down in the range will receive a higher pay-rise than one near the top. Those near the top must have extremely high performance ratings to earn a real pay-rise. • Key results: 1. The majority of employees are paid towards the bottom of the range but a disproportionate number of employees are at the very top of the range implying that salaries are constrained at the top. 2. Those employees with salaries near the maximum of the allowable range for their job tend to have falling performance ratings and salary growth, are less likely to win promotion and are more likely to exit the firm.
Groot and Oosterbeek (1995)	• Uses a switching regression model to examine the worker-specific and firm-specific factors that determine the likelihood of a worker's compensation being incentive-based. Separate regressions examine the determinants of pay-level for these two groups. • The form of compensation of a particular worker-job match is determined by both worker and job characteristics. A model is constructed which enables the influence of both sets of characteristics to be separately evaluated. • Uses BHPS 1991 data, which includes the direct question, "Does your pay include incentive bonuses or profit related pay?". Person-specific variables are the standard human capital variables (education, labour market experience etc). Key job specific variables include dummies for private sector, permanent employment contract, supervisor, promotion possibilities and job performed outside firm premises. Also included are dummies for whether a substantial share of the workforce is female and whether workers are represented by a union. • Descriptive stats: a) Almost 32% of all workers receive incentive pay of some sort. b) On average workers on incentive pay earn 17.4% more than those on fixed wages. • Key results for selection equation: 1. Education and experience both have a negative effect on the likelihood of incentive pay 2. Uncertainty, measured by the difference in dispersion of the two wage regimes, has no significant effect on the likelihood of incentive pay but the difference in levels does have a significant effect, in that for each 1% increase in the reservation wage, the differential between incentive and fixed pay has to rise by 1/3% to compensate. 3. Married workers are more likely to be incentive paid. 4. Private sector offers incentive pay more frequently. 5. Likelihood of incentive pay is positively correlated with size and union variables. 6. Incentive pay is more likely for workers on permanent contracts, those in jobs with promotion prospects and those who work outside firm premises. Key results for separate earnings equations:

	1. Most industry dummies have a significant explanatory effect on the level of incentive pay but not on the level of fixed wages 2. There is a significant tenure effect on incentive pay but not on fixed wages, ie. wage profiles for those on incentive pay are steeper than for those on fixed wages. 3. Wage dispersion in both groups decreases with tenure.
Groshen and Krueger (1990)	• Using Bureau of Labor Statistics data on 300 hospitals in 1985, the effect of supervision intensity on workers' wages in four occupations is examined. • Key results: 1. Wages for nurses fall as supervision increases 2. Wages for food service employees, radiographers and physical therapists are not significantly correlated with supervision intensity
Hall (1998)	• Uses detailed 1980-1994 panel data on stock option contracts for CEOs in 478 large US firms to examine the pay to performance incentives of executive stock options. • Characteristics of CEO stock option packages: a) The vast majority of packages are either fixed number or fixed value. b) The vast majority also have an exercise price equal to current share price, although some have a lower price and some have a higher price. c) The sensitivity of an option is greater the lower is its exercise price, so a unit of stock is always more sensitive than an option. The sensitivity to value relationship is greater, however, for higher exercise prices, so fixed value options are more performance sensitive than fixed number. • Key results: 1. The relationship between stock price performance and the value of future stock option grants is 5-8 times (depending on whose estimate you take) stronger than the analogous relationship between stock price performance and salary+bonus. A 10% increase in current stock price yields on average 9.5% increase in future stock option value compared to 1.2% salary +bonus increase. 2. The compensation of those CEOs with fixed number option plans exhibits a significantly higher performance sensitivity than those with fixed value plans as expected.
Hall and Liebman (1997)	• Uses 1980-1994 panel data set on CEOs in 478 large US firms including full compensation description (ie includes stock options) to show that CEO compensation is very closely related to firm performance. It is also shown that the level of CEO compensation and its sensitivity to firm performance increased dramatically over the 15 years.
Heckman, Smith and Taber (1996)	• Examines how the incentive structure set out through the funding of the Job Training Partnership Act (JTPA) affects the type of applicant that is more likely to be accepted • Under the JTPA system, local training centres receive monetary rewards based on the employment levels and wage rates attained by trainees upon completion of the program. This creates an incentive for the program manager to 'cream-skim' the most employable applicants into the program. • Sample includes 421 accepted applicants and 859 rejected applicants of a single JTPA centre. Of the accepted applicants, 129 had their training deferred for 18 months to act as a control group. For each member of the sample, race, age, education, employment history, family composition and income are all observed. • Predicted earnings levels and earnings gains following the program are calculated and used as independent variables in a regression estimating the probability of acceptance. • Key results: 1. People with lower expected earnings levels are more likely to be accepted into the program. This finding is robust to a number of specifications. 2. Weak evidence suggests that those with larger expected gains are more likely

	to be accepted. • The first result is contrary to the cream-skimming theory and suggests that bureaucratic preferences for helping the disadvantaged dominate over pecuniary incentives in this case. • Previous work that has found evidence of cream-skimming is subject to the problems of selection bias since all those eligible for JTPA places are included rather than just those who have applied.
Holmstrom (1982b)	• Seminal paper on what has become to be known as "career concerns" • Studies how an individual's career concern may influence his incentives to exert effort or make decisions on the job. In the model, the ability is revealed over time through a series of observations on performance. There are no explicit rewards, yet wage in each period depends on expected productivity which is a function of observed performance in previous periods. This creates an "implicit contract" linking contemporaneous performance to future wages. **Basic Model** • Assume that talent (η) is fixed and symmetrically unknown to both manager and firm. ie. they both hold identical priors which are assumed to be normally distributed with mean m_1 and precision (inverse of variance) h_1 . Over time learning takes place about η based on observations on y. In period t, output is given by the technology: $y_t=\eta+a_t+\varepsilon_t$, t=1,2 where $a_t \in [0,\infty]$ is the manager's labor input and ε_t is a stochastic noise term distributed with mean 0 and precision h_ε. • The firm can learn about η through observations of y since it is assumed to know the managers optimal decision rule and the distribution of noise. The mean process m_t is shown to be a random walk with incremental variance that declines deterministically to 0; ($h_t \to \infty$). In the limit, η is hence fully known and it is shown that the equilibrium sequence of inputs therefore also declines to zero since what affects effort is the ability to influence the market's beliefs about the manager's ability. Where there is no uncertainty there is no effect of effort on beliefs. No effort will be exerted. • The above result relies on talent being fixed. An alternative hypothesis is that ability evolves over time according to the process: $\eta_{t+1} = \eta_t + \delta_t$ where δ_t are independently distributed with mean 0 and precision, h_δ . The effect of this is to keep adding uncertainty into the learning process such that instead of tending to infinity, h_t tends to a constant state h* in which learning through observations on output exactly offsets the delta shocks. • Results under stationarity: 1. If no discounting occurs (i.e. if the manager's atemporal utility is time independent) then the efficient level of effort is induced 2. Career concerns are more effective if the ability process is more stochastic or if the observations on output are more accurate. Both features together bring forward the investments from effort, reducing the deleterious effects of discounting. 3. Assuming that precision on ability converges upwards to it's stationary state, effort levels converge monotonically downwards to their stationary state. That is, young workers will overinvest in labor supply because the returns from building a reputation are highest when the market information is most diffuse. 4. When non-linear returns to ability are introduced, it is shown that the need for explicit incentives is less where the returns to ability are convex. **Incentives for risk-taking** • Firms frequently express concern that managers, particularly younger ones, take too few risks. This can be accounted for by career concerns. If talent is not fully known then investment decisions become indicators for talent. The risk from an investment decision can be passed on to the manager in the form of expected future wages.

	• Talent is associated with the likelihood that investments are successful. Let y_- be the payoff if the project fails and y_+ if it succeeds. Let the probability that a project succeeds be I_T if the manager is talented and I_N if he is not. Then probability of success is: $p = I_T \eta + I_N (1-\eta)$ • Incentive problems are associate with proposing the wrong projects not misrepresenting information about a particular project. Whenever the payoff to a lottery is a linear function of the posteriors, the expected payoff is equal to the prior. Hence the expected value of undertaking any investment project is equal to the managers talent η. Since the investment carries risk, given the above informational assumptions and risk aversion, the manager would rather claim that no opportunity exists. In order to give the manager an incentive to take on this risk (which is not the same risk as that facing the firm) he must be given a share in y_+ if the project succeeds. • Even a risk neutral manager will not invest if his investment proposals risk can not be validated. [via Akerlof's lemons argument]
Holmstrom and Milgrom (1991)	• Constructs a model showing from an incentive perspective how optimal compensation contracts are constructed and the expected form of this contract in various situations • It is shown how asset ownership shapes the principal-agent contract such that if the agent owns the asset then the contract will be output based rather than time based.. An example of this is in McDonalds. 30% stores are owned by McD, the rest are franchised. The managers of McD owned stores receive no explicit sales/profit related bonus. Franchisers pay 10% royalties to McD implying 90% commission.[ref. Krueger (1991)] • Further exploration shows how the firm may design contracts to limit the "outside" activities of an employee in working hours. The model predicts that there will be more formal constraints on agents' outside activities where performance rewards are weak due to measurement problems • A theory of job design is then proposed which predicts that agents ought not to be jointly responsible for single tasks (ie. each agent's pay contingent on an exclusive subset of tasks.) Cost of effort is independent of task and hence the sharing responsibility for a task increases the total risk that each agent faces without any benefit. • It is also predicted that the subsets of tasks will be grouped around the cost of measuring and rewarding performance. That is, some agents will perform easy-to-measure tasks which all receive a performance contingent component, others will perform difficult-to-measure tasks on a fixed wage. This prediction is based on the theory that mixing easy and difficult-to-measure tasks gives agents an incentive to substitute effort away from difficult to easy.
Holzer (1990)	• Examines the direct effect of productivity on earnings using data from a nationwide sample of firms which includes answers to the question: "How productive is X employee on a scale of 1-100" • Included in the regressions are the standard variables:, age, tenure and training all in quadratic form as well as sex, education and industry dummies. Wage and productivity level and growth regressions are performed • Results: 1. Previous experience and current job tenure have significant positive effects on wage and productivity levels. Tenure also has a significant positive effect on wage and productivity growth. 2. No. hours training has a significant positive effect on wage and productivity growth 3. Tenure has a positive influence on wage level even when productivity is controlled for.
Ichniowski, Shaw and Prennushi (1995)	• Discusses and tests the influence on productivity of several Human Resource Management (HRM) practices. • Uses panel data set of monthly observations on the productivity of 36 steel finishing plants across USA. Data set includes details of the production processes, values of the

	inputs and HRM practices. • The production process is essentially homogenous across plants but 54 distinct HRM environments are observed in the sample. (Some plants made changes during the period covered) • Correlations among HRM practices: I. Group incentive pay plans are significantly positively correlated with intensity of recruit screening, team based work structures, labour-management communication and the extent of worker involvement in team activities. II. Employment security is significantly positively correlated with intensity of recruit screening, labour-management communication and certain measures of job flexibility • Because of these significant correlations, HRM practices are tested together as sets rather than individually. Four practices are defined ranging from traditional (System 4) with strict work rules, narrow job responsibilities, no work teams, little labour-management communication, little training and extensive supervision, to System 1 which includes all the innovative HRM practices: Extensive recruit screening, subjective and objective incentive compensation plans, teamwork, training, job flexibility, labour-management communication and employment security. • Results: 1. Controlling for inputs other than labour (including technology level, quality of steel input and regularity of maintenance amongst others), the results show that productivity rises at each step from System 4 up to System 1. The difference in productivity between these 2 extremes is about 7%. (The coefficients on the control variables have their expected sign and are statistically significant at 5%)) 2. Individual HRM practices have an insignificant marginal effect 3. Results are the same when adjusted for quality. • Conclusion: HRM practice significantly influences productivity.
Itoh (1992)	• Extends Holmstrom and Milgrom's (1991) principal-multiagent multi-task model to one which predicts co-operation in organisations and a shift away from a purely hierarchical structure. • HM predicts that it is not optimal to have responsibility for a single task shared between agents because of the free rider problem and instead Relative Performance Evaluation (RPE) dominates. • Itoh distinguishes between Induced co-operation and Delegated co-operation • Induced co-operation occurs when there is a 'grand contract' under which all agents act independently on behalf of the principal. The specification of this grand contract makes it in each agent's self-interest to share joint responsibility for a task. In delegated co-operation, agents write side contracts with each other which are unobservable to the principal. Successful side contracts cause the agents to co-operate as a group.. • INDUCED CO-OPERATION: Assuming cost of effort functions decreasing in both tasks, an increasing concave payoff function of combined effort only for both tasks (ie no random component) and uncorellated task-specific performance measurement errors, it is shown that it is optimal to make the agents jointly responsible for the two tasks. • There is a trade off , however, between induced co-operation and RPE once the assumptions are relaxed. These two forms of grand contract are incompatible since each agent will have the incentive to reduce the other's performance measurement where possible. The choice between the two depends on the correlation of performance measurement errors between the two tasks. There exists a cut-off point below which induced co-operation is preferred. • Induced co-operation is more likely to be preferred to RPE as: 1. Agents are less risk averse 2. The difference in the difficulty of providing incentives (in terms of performance measures and costs of actions) is smaller among tasks 3. Productive interaction among agents is inevitable

	4. The principal can prevent sabotage under RPE. • DELEGATED CO-OPERATION: When induced co-operation is the preferred contract type (ie the performance measurement error correlation between tasks is sufficiently small) it is more efficient for the principal to allow delegated co-operation when agents perfectly observe each other's performance measurement and can write side contracts to provide mutual insurance. A contract can be written in advance by the principal which takes into account the side contracts and hence achieve a higher net payoff through delegated co-operation • Where agents' information is no different from the principal's, the principal is never better off with side trades than without them. • When agents are jointly responsible for tasks (induced co-operation), whether or not team production prevails, delegated co-operation is more likely to be attained as the agents are more similar in terms of cost of effort and risk attitude.
Jensen and Murphy (1990)	• Examines the pay-performance sensitivity of CEO compensation • Data from *Forbes* Executive compensation surveys on 1295 companies from 1974-1986. [Compensation in the form of stock options is not adequately recorded. Only the gains from exercising the options are included in each year's observation and the value of the options granted in any year is not given.] • Change in firm value is used as the performance measure • Key results: 1. Salary and bonus increase by \$0.22 for \$1000 increase in firm value. This estimate is similar to Gibbons and Murphy (1990), Coughlan and Schmidt (1985) and Murphy (1985, 86) 2. Using additional data on stock related increases in CEO wealth, the estimated sensitivity rises to a maximum of \$3.25/\$1000. [Small firms:\$8.05/\$1000; Large firms: \$1.85/\$1000] 3. Median CEO inside stock holdings fell from 0.3% in 1938 to 0.03% in 1984. • Such a small pay-performance sensitivity and the fact that it is evidently reducing is puzzling. It is hypothesised that political forces inside organisations limit large payoffs for exceptional performance.
Jones and Kato (1995)	• Uses panel data on large Japanese manufacturing companies to test the effect of introducing ESOPs and bonuses on productivity. • Key results: 1. In a variety of specifications, it is consistently found that the introduction of an ESOP increases productivity by 4-5% on average and that this increase occurs after a period of 3-4 years. 2. Evidence shows that a 10% increase in bonus payments leads to a 1% increase in productivity on average 3. There is weaker evidence that complementarity exists between bonuses and ESOPs.
Kahn and Sherer (1990)	• Uses longitudinal personnel data on managers from one company to analyse the relationship between financial incentives and performance. • An individual performance statistic (rating 1-6) is calculated for each employee and is standard across all jobs within the firm. This statistic is subjectively determined by the employee's immediate manager but is always based on the same evaluation procedures in which each appraiser is comprehensively trained and is systematically monitored in order to be consistent across the firm. • (Exit rate is only 0.5% per year for this sample) • Different employees operate under different incentive structures. Specifically, the bonus system is directed towards those managers who work in high level positions in corporate HQ and have low seniority. High performers in this category receive the largest bonuses • Key result: Managers for whom the impact of performance on bonus is high have higher subsequent performance levels than other managers, even controlling for past

	performance.
Kandel and Lazear (1992) "Peer pressure and Partnerships"	• Questions considered are: 1. Does profit-sharing foster peer pressure? 2. How are "norms" established and do they affect motivation within the firm? 3. Are incentives weakened as firm size increases? 4. Is the firm, dept or some other unit's size key in determining effort? 5. When do workers have incentives to engage in mutual monitoring? 6. Why do partnerships form among individuals in the same occupation? • It is shown how group pay-off function implies lower effort because of free-rider effect. • Peer pressure function is introduced [P(e, a)] which is incorporated into the maximand of each individual. e is vector of each individual's effort; a is vector of each individual's pressure actions. • Positive peer pressure is shown to increase effort in profit-sharing environments. **Creating peer pressure** • In order for there to be peer pressure, there must be some incentive for workers to allocate effort towards creating it. • Guilt and shame are distinguished by the direction of pressure - guilt is internal, shame is external pressure. When other workers can observe one's effort, shame can be employed. Otherwise, however, guilt is the only tool available. • Example is given of the military whereby investment in team bonding is undertaken in order to espouse loyalty as an individual incentive to avoid punishment by guilt in situations of external unobservability. • It is hypothesised that profit sharing creates empathy towards those who receive the residual profit. Workers more readily empathise with other workers than with faceless shareholders. Further, the more empathy there is towards residual claimants, the greater is the effort induced by peer pressure. Team-building / corporate culture may induce more motivation when coexistent with profit sharing / group PRP. The converse is that partnerships ought to be associated with more team spirit and spirit building investment. **Norms** • Let the peer pressure function be $P(e^{bar}-e_i)$. For a suitable punishment for deviating from the norm, efficient effort can be enforced by such group norms. • A norm is an equilibrium phenomenon such that deviations on all margins yield net disutility. **Mutual monitoring** • Let P( ) be $P(e_i, (N-1)a_j)$. Each individual chooses a level of effort (a) to devote to monitoring and a level of effort towards production. Both are subject to free-rider incentives. • It is expected that partnerships of lawyers or partnerships of accountants will exist but not partnerships combining the two professions because mutual monitoring is more effective where knowledge is shared. In general, partnerships should be less prevalent amongst individuals specialising in non-overlapping tasks. • For example, it may be advantages for a labor lawyer and a tax lawyer to jointly serve a client. One could hire the other. The formation of a partnership says more about incentives and peer pressure than about technology. **Firm size** • It is likely that peer pressure will increase with firm size up to a point and then decline
Kaplan (1994)	• Examines the correlation of executive turnover and compensation with performance measures for large Japanese and American firms • Several performance measures are examined and compensation includes stock and stock options.

	• Key results: 1. Very little difference in the sensitivities of executive turnover and compensation to performance between Japan and USA although Japanese compensation is significantly less sensitive to stock price than is USA. 2. Japanese executives' compensation is typically less than half that of their American counterparts.
Knoeber and Thurman (1994)	• Uses data on 75 broiler chicken contract producers between 1981 and 1985 to test the following predictions of tournament theory: I. Changes in the level of prizes that leave absolute differentials unchanged will not alter performance II. In mixed ability tournaments, the more able players will choose less risky strategies III. Tournament organisers will attempt to handicap players of unequal ability or reduce mixing. • Individual producers are contracted to grow out broilers from a quantity of chicks and food supplied by the "integrator". The data can be split into 4 periods, each involving different rewards. Performance is measured and rewarded in two different ways: by rank-order in periods 1 and 2, and by linear relative performance evaluation (LRPE) in periods 3 and 4. In periods 2 and 4, base pay increased whilst holding differentials constant. • Results: 1. The effects of the changes in base pay on performance are statistically insignificant. 2. Variance of performance is negatively correlated with grower ability and this correlation is weaker for LRPE periods. 3. The number of chicks per house allocated to each producer has a negative net effect on performance and so can be used as a handicapping device. The evidence is consistent with the proposition that the integrator gives higher ability producers more chicks per house, (although this may not necessarily be the case), and that handicapping is stronger in the 2 tournament periods than in the LRPE periods. • Each of the predictions is thus supported by the data.
Kruse (1991)	• Uses panel data on 2976 US firms from 1971 to 1985 to test Weitzman's theory that firms using profit-sharing as part of employee compensation will tend to have more stable employment. • Evidence is presented which weakly supports this theory in that a 1% increase in aggregate unemployment leads to profit-sharing manufacturing firms' employment decreasing by 2% compared with 3.1% for non profit-sharing firms. There is no such clear separation for non manufacturing firms. • Overall, this paper provides no substantive evidence for or against the benefits of profit-sharing as an employment stabilising practice.
Lambert, Larcker and Weigelt (1993)	• Examines the structure of compensation in 300 large organisations. • 4 hierarchical levels are distinguished for each firm from plant manager to corporate CEO. Compensation data for employees at each level is collected including stock options and shares. • Key results: 1. Interrank spread of compensation increases up the hierarchy • Results provide limited support for tournament theory.
Lazear (1986)	• Gives a theoretical analysis of the determinants of method of pay. • Reasons for salaries vs piece rates: 1. Sorting by ability. Paying a piece rate screens potential employees such that a separation occurs with high ability employees working on piece rates + low ability on time rates. For an ability distribution of q, results:

	The cost of sorting is the cost of measuring output. This is traded off against the benefit of sorting which rises with the value of the reservation wage and the variance of the distribution of q and its shape. That is, a skewed distribution with a large lower tail below the reservation wage is an ideal candidate for piece rate compensation if the cost of monitoring is not excessively high. The cost of monitoring directly reduces the total value of wages paid out. So firms paying salaries should, in general, have a lower quality workforce and pay a lower average wage. Where capital/worker is high, sorting becomes more beneficial Salaries are assumed not to be devoid of incentives, but the incentives are the choice in number of hours to work given the hourly pay where effort per hour is monitored with some degree of accuracy. Thus degree to which effort input can be monitored and the cost incurred of such monitoring is equivalent to cost of output measurement. Assuming a minimum effort level can be monitored with cost less than that of measuring output [i.e. $\theta_2 < \theta_1$] Then salary will be paid if and only if:z $E^{\min} - q_2 - C(E^{\min}) > E^* - q_1 - C(E^*)$ Hence: $q_1 - q_2 \geq (E^{\min} - E^*)^2 \left[\frac{C''(E^*)}{2} \right]$ where the RHS uses second-order Taylor expansion around E* since C′(E*)=1. 3. Risk aversion affects the choice of method of pay a workers prefers. Lazear claims that variation in income from period to period is not very important but lifetime variation is. Salaries are more likely when the workers' risk aversion is less than the employer's. 4. Quality considerations do not affect the choice of payment method unless it is much more costly to monitor quality than quantity. 5. Intertemporal considerations also do not affect method of pay assuming a full contract can be specified in advance.
Lazear (1998)	• Using data from a large autoglass company (Safelite) that changed compensation structure form time to piece rates between 1994 and 1995, the sorting and motivation predictions raised in Lazear (1986) are tested. • Results: 1. The switch to piece rates caused average output to rise by 44% 2. By including worker-specific dummies for 2755 individuals, it is shown that, on average, the switch to piece rates caused the individual worker to produce 22% more output. This supports the prediction that piece rates have a motivation effect. 3. The rest of the 44% gain is the sorting effect of being able to retain and recruit a higher performing workforce. Turnover amongst high output workers fell from 3.5% to 2.9% but went up from 4.6% to 5.3% for normal output workers. The rest comes from the improved ability to recruit high ability workers. 4. Absenteeism fell. 5. The variance of output per worker increased from 2.02 to 2.53. • Results strongly indicate that incentives do matter. The effects of the switch in compensation scheme are large and statistically precise.
Lazear (1998) "Personnel Economics" and "Personnel Economics for Managers"	• Teams exist because of the benefits of joint production. • When individuals work in teams it tends to be more difficult to observe individual output. • Teams should thus be set up when the benefits of joint production outweigh the costs of monitoring/free-riding.

	• Benefits of teams include: 1. Complementarity 2. Specialisation 3. Knowledge transfer **Complementarity** Teams are more efficient when the whole is greater than the sum of its parts. Example: a heavy load requires two people to lift it. **Specialisation** When many workers specialise in small tasks, the final output may be produced more efficiently than were each worker to engage in the whole production process. **Knowledge transfer** Probably occuring more when specialisation is not too great, knowledge transfer allows a pooling of knowledge which is beneficial if workers have idiosyncratic pieces of information and some of the idiosyncratic information of one worker is valuable to some other individuals in the team. • Size matters. Large teams suffer from communication problems. Small teams do not allow much specialisation or knowledge transfer. • Peer monitoring matters when there is group output contingent compensation. Free rider effects are lower in smaller teams and in teams where the output of a worker can be assessed by other team members. • Group incentives can be explicit or implicit. Explicit incentives are created by group PRP / profit sharing etc. Implicit incentives are created when workers are treated better / more likely to receive a promotion or wage increase if the group does well. • Norms can also generate effort but require investment to set up and some mechanism to punish behaviour deviating form the established norm. • An alternative view of profit sharing is that it exists to distribute risk • NB: Further references are given to Kandel and Lazear (1992)
Lazear (1999)	• Surveys the current state of "Personnel Economics" and suggests directions for future research • **Is deferred compensation used as a motivator?** • Medoff and Abraham(1980) use subjective assessment data from one firm to show that wages rise more rapidly than productivity. Spitz(1991) shows same result for supermarket clerks. Lazear (1996) shows that tenure coefficient in wage regression is always higher than that in productivity regression regardless of specification. • ***So earnings rise faster than productivity, so what?*** • Consider investment in On the Job Training (OJT) If investment is in general human capital, worker bears the full cost (and receives full benefit). As a result he is paid his marginal product at all times. If firm-specific then worker and firm share costs and rewards, hence experience-earnings profile ought to be flatter than experience-productivity. • The evidence suggesting an experience-earnings profile steeper than sxperience-productivity is completely opposite to the OJT theory of wage determination. Lazear's worklife-incentive theory provides one solution. • **Within-job vs between-job wage growth** • Tournament theory focusses on wage growth associated with promotions. The mapping from job-structural hierarchy to salary distribution can be modeled by tournament theory. • Promotions explain a large proportion of wage growth. People need to change the type of job they do in order to earn a future wage significantly higher than current wage. • **Salaries vs Piece rates**

	• ***Do workers respond to incentives in the predicted fashion?*** • Lazear (1996) uses data on Safelite auto windscreen fitters to provide strong support for predictions raised in Lazear (1986). These predictions concern both motivation and sorting as responses to incentive pay. • ***Are wages 'compressed' ? Why?*** • Wage compression is a response to the problem of sabotage/non-cooperation that is induced by relative performance evaluation. There is evidence in the Safelite paper (1996) that even when compensation was switched to piece rates wages were still compressed relative to output. It is not possible to prove why. • ***How important is 'peer pressure'?*** • There is evidence of peer pressure inducing increased effort of the low ability. The switch to piece rates caused the output of the low productivity workers to increase by 32% . These workers received no additional payment for this - they were still producing less than the cut-off threshold and were hence still paid the minimum hourly wage. The reason for the improved performance can be attributed to the introduction of a higher expectation of the minimum output required to retain one's job due to the fact that high output workers were producing loads more. • **Turnover** • ***What intra-firm factors influence the likelihood of separation for a particular worker?*** • Using a large panel dataset from a financial services firm, it is shown that turnover is less likely for: 1. those having experienced recent promotion 2. higher earners 3. older workers 4. higher performers • Above must be interpreted with caution. • **Business environment** • Firm growth, wage growth and promotion rate all move together in this firm. • Cohort effects are large in wage determination.
Leonard (1990)	• Examines the effects of executive IS on performance of 439 large US firms between 1981 and 1985 and the role of firm characteristics in determining IS choice. • Participating firms were asked to report on the pay and personal characteristics of a representative sample of 75-100 incumbents in a variety of job families, managerial levels and organisational units • NB: There was considerable turnover of survey firms from year to year, and pay does not include fringe benefits, pension plans or stock options • Components of variation of log of executive pay (base+bonus) isolating company, occupation, hierarchical position, human capital, unit sales, year and joint effects) reports only 8% variance attributed to individual company effects. • Regression of Return On Equity (ROE) on dummy variables indicating the presence of long-term incentive plan or bonus plan, an index of the number of levels of hierarchy per 100 employees, promotion rate, exit rate, steepness of pay profile, mean pay, standard deviation of pay and vectors of dichotomous variables for companies 2-digit industry codes. • Key Results: 1. Bonuses are associated with higher average ROE but have no significant effect on changes in ROE 2. Firms with long term incentive plans have lower ROE on average but higher growth 3. Firms with a higher degree of hierarchical structure have lower ROE on average but higher growth 4. No significant correlation between variance of managerial pay within a firm and the firm's subsequent change in ROE. ie equity does not improve firm performance.

	• NB By 1985, long-term incentive plans and short-term bonus plans had been almost universally adopted.
Loewenstein and Sicherman (1991)	• Experiment showing that the majority of people would rather have an increasing wage profile than a decreasing one for the same undiscounted sum. • 80 random adult members of the public were directly questioned as to their preferred 5 year (sole) income profile from a choice of increasing, flat or decreasing both before and after arguments were presented to them to assist their choice. They were then asked the reason(s) for their choice. • Even after the economic argument was presented, only 25% of choices were consistent with present-value maximisation and, of these, just under 40% cited reasons other than present-value considerations such as immediate spending needs. • The most common reason cited for preferring an increasing wage profile was simply that they derive pleasure from having more income each period. Inflation and an aversion to decreases were also popular. • A maximum likelihood logit estimation of the relationship between present value maximisation and individual characteristics reveals that males, college graduates and married people are more likely to be present value maximisers. Age and income also have a small positive influence on this propensity.
Main (1992)	• Tests the extent to which CEO pay is tied to performance and the effect of the pay-performance sensitivity on future firm performance. • Uses UK data on 512 firms that all had 5 or more complete consecutive observations between 1969 and 1989. Data consists of CEO salary + bonus (no stock options or pension entitlements), company sales, stock price, dividends paid and number of directors. CAPM beta is calculated to control for the effect of general stock market movements. • Key results: 1. Total predicted impact of an increase in shareholder wealth on CEO pay is £44.89 per £1m 2. Total predicted impact of an increase in sales on CEO pay is £14.71 per £1m. 3. CAPM beta and number of directors have no significant influence on pay-performance sensitivity. 4. No significant correlation between pay-performance sensitivity and subsequent firm performance
Main, O'Reilly and Wade (1993)	• Examines the reward structure for executives to test for the presence of tournament theory predictions or wage compression. • Data: Survey of the top executive compensation packages in over 200 large corporations 1980-1984 • Key results: 1. The average percentage return to promotion rises markedly as one moves up the hierarchy, both in terms of the immediate pay-rise and the present value of the increased earnings stream. (Consistent with tournament theory) 2. The (approximate) present value measurement of the return to promotion from Vice-President to CEO averages $4.6m excluding fringe benefits. 3. The above variable is positively correlated with the number of VPs within the firm; each additional VP contributes 3% on average. (Again consistent with tournament theory) 4. Firm performance (proxied by Return On Assets (ROA)) is positively related to average executive compensation and also positively related to the variance of executive compensation. ie Firms with compressed wages for top executives fare worse for a given average pay level. 5. Mean executive wage is negatively related to wage compression. 6. Measure reflecting the interdependence of top managers is not positively correlated with wage compression • Conclusion: Evidence is far more supportive of tournament theory than wage

	compression for the top jobs in organisations.
Malcomson (1998)	• Surveys the recent literature on individual employment contracts. The focus is on the reasons why contracts exist in labour markets and how the employment relationship differs from a spot market. • Summary of stylised facts: 1. Nominal wages are somewhat rigid in the short term and are certainly not adjusted instantaneously to labour market changes. 2. Wage levels do not appear to fluctuate as much over the business cycle as a spot market model would predict, especially for long-term continuing employees. 3. Individual wages seem to depend on the past, for example the sequence of unemployment rates over the history of the job. 4. At least some wages include firm or job specific premia, although there is debate about the extent of wage growth with tenure. • Contracts have 3 benefits: 1. To allocate risk: 2. To protect investments 3. To motivate employees **1. To Allocate Risk** • Such contracts ought to yield observations of hours, earnings and employment fluctuate less than that predicted by a conventional labour supply curve. • Evidence is not supportive of risk allocation as the prime motivation for contracts. Blinder and Choi (1990) report only 10/19 managers (53%) thought the idea plausible or relevant. Hall (1993) reported 77% for a similar question of which 46% indicated that they experienced higher rates of staff turnover in boom years as a result of providing wage stability **2. To Protect Investments** • Workers invest in the firm (setting up home, learning the job) and firms invest in the workers (paying for general and firm-specific human capital aquisition). The absence of a contract can lead to suboptimal levels of investment by both parties. The extent to which each party's investment is held up depends on their ex post relative bargaining power (Grout (1984)). This hold up also affects the firm's investment in physical capital, the rents on which can be partly captured by workers if they have power. Contracts can be written ex ante so as tp reduce the extent of hold up problems and protect investments. **3. To Motivate Employees** • Where performance is not verifiable in court, a performance contingent contract based on reputation can motivate employees to exert effort
Manning (1998)	• Constructs and tests a model explaining the earnings-experience profile in terms of job search. • Uses panel data to show that the job search model (which excludes the effect of human capital completely) fits very well with the data.
Marsden, D. and S.French (CEP)	• Studies the effects on staff motivation, morale and work satisfaction of performance pay. • Most staff, except head teachers agree with the principle of performance pay. • Up to a half of line managers in the civil service and hospitals believe PRP has raised productivity, improved goal setting and, to a lesser extent, raised quality • Most staff believe it has not raised their own motivation • Most staff believe it is divisive, undermines morale, causes jealousies and inhibits workplace co-operation • Many believe line managers use PRP to reward their favourites. • Many believe higher management unfairly restricts performance pay by means of

	quotas • Group PRP scores much better for morale and co-operation than individual PRP, but less well on goal setting. No other significant differences between the two schemes
Medoff and Abraham(1980)	• Uses detailed personnel data on all employees in two large US corporations to show that those paid more are not necessarily more productive • Productivity is measured by the results of an annual subjective supervisor performance review. It is assumed that for a given occupational grade level, an employee with a higher performance rating is more productive. • An earnings function is estimated using dummies for performance ratings. Logit models estimate the probability that a worker will be in the top salary band and the probability of being in the top performance band • Key results: 1. Employees with more than average pre-company experience and company service have higher than average salaries. 2. About 40% of these earnings differentials occur within grade level. 3. *These earnings differentials cannot be explained by productivity differentials*
Murphy (1986)	• Examines the compensation of 1488 CEOs from 992 large US firms 1974-84 to test whether learning or incentives is the appropriate underlying economic theory in a multiperiod environment. • Only includes salary + bonus, no stock options or other benefits. • Regresses dln(salary+bonus) on years in firm, rate of return and control variables for 3 tenure bands: fewer than 21 years, 21-30 years and over 30 years with the firm. (In a separate table, the results are reported for bands of years as CEO) • Key results: 1. Earnings growth decreases with experience 2. The relation between pay and performance is always significantly positive but ***declines*** with tenure. • A separate data set of 73 manufacturing firms is used to examine the award of stock options. It is found that the proportion of CEOs receiving stock options in any one year declines with tenure as a CEO and that the average value of stock options awarded also declines. • These results are evidence in favour of the learning hypothesis over the incentive hypothesis according to Murphy, since the incentives hypothesis in a multiperiod environment predicts increasing contemporaneous performance component of pay with experience as the ability to use future rewards as incentives decreases. Learning hypothesis predicts the opposite such that expected marginal product (the determinant of pay) varies less from year to year as tenure increases and so the link between pay and performance ought to decline with tenure as observed.
O'Reilly, Main and Crystal (1988)	• Assesses 3 models of CEO compensation determination: I. Marginal product II. Tournament theory III. Social comparison model (external directors on the compensation board base CEO compensation on a comparison with their home companies) • Data: 105 firms for 1984, taken from a Business Week survey • CEO compensation is firstly regressed onto Return On Equity (ROE), Sales, Assets, Number of employees, Term as CEO and dummy variables corresponding to industry and whether the firm is owner controlled (>5% stock owned by single individual/organisation) • Key results: 1. Only Sales and a few industry dummies have significant influence on CEO compensation at 5% level. Assets and Number of employees have small negative coefficients. Term and ROE are positive but insignificant. 2. Adding Number of Vice Presidents (VPs) and Average salary for top VPs to the regression to test the tournament theory prediction that the gap between

	CEO and VP salary increases with additional VPs, yields opposite results to those expected; Number of VPs has a significant negative coefficient. 3. For a range of specifications, CEO compensation is always significantly positively correlated with measurements of compensation board salaries. • Concludes that comparison is the most prevalent form of CEO compensation setting.
Osterman (1994)	• Uses 1992 data on core jobs in 875 large US establishments to find out how workplace human resources are managed in terms of the prevalence of modern "high performance work organisation" practices and the firm characteristics which influence their adoption. • Survey asks about four such practices: i. Self-directed work teams ii. Job rotation iii. Employee problem-solving groups (quality circles) iv. Total Quality Management (TQM) • A suggested definition of a "transformed" workplace is such that >50% employees are involved in at least 2 of the above practices. By this definition, 43% of non-manufacturing establishments and 35.9% of manufacturing establishments are "transformed". • To test for the key firm characteristics which influence the adoption of these practices, 3 approaches are used: a) Logit model where dependant variable = 1 if >50% employees are involved in at least 1 practice. b) Principle components analysis c) Probit model where dependant variable ranges from 1 to 4 depending on the number of practices employed at the 50% penetration level. • The strongest positive influences on adoption of the "high performance" practices are: 1. High firm values = How much the firm cares about the development of its staff 2. High exposure to international markets 3. High skill level required for core job 4. Strong emphasis on quality in production 5. Large establishment size. • There do appear to be systematic differences between firms adopting at least 1 practice (at 50% penetration) and those adopting none. • There is no evidence of clustering of work practices, however many have been in place for under 5 years.
Osterman (1995)	• Uses 1992 data on core jobs in 875 large US establishments to analyse their training patterns, hiring criteria and skill requirements in order to determine the influence of work organisation on training practices. • Using tobit estimate of off-the-job training, key results are: 1. Use of high performance work systems (eg labour-management communication, job flexibility etc) are positively associated with increased training 2. Blue collar employees receive less training than white collar. • This paper concludes that more flexible work arrangements require more training. However, form of organisation could well be endogenous.
Paarsch and Shearer (1997)	• Uses data concerning the daily productivity and wages of workers in the tree-planting industry of British Columbia over a planting season (6 months) in 1991. Only those workers who operated under both piece rates and time rates during this period are included in the sample. • A model of contractual choice is constructed based on interviews with managers: A worker can plant trees well or badly and the marginal effort required to plant a tree well increases as conditions worsen. The worker is more likely to plant trees badly under piece rates when the conditions are poor (since piece rates are set at a higher level) and so the extent of the use of piece rates is inversely related to the quality of the

	conditions • The model is used to make predictions which, when tested, give rise to the following results: 1. Switching from time to piece rates yields an improved productivity of 59%. This is calculated as the increase in average number of trees planted and is cited as an upper bound on the improvement in productivity. The lower bound is calculated as the improvement in average wages, which is 10%. 2. Using the model of contractual choice to estimate the proportion of the 59% attributable to incentives alone (removing the effect of conditions) suggests that only approximately 24% of this variation can be accounted for by incentives. Thus endogeneity of contractual choice is very important when estimating the effect of a change in compensation arrangements, but performance incentives do still significantly affect productivity. • Conclusion: Incentives do matter.
Pendleton (1997)	• Uses WIRS 1990 to test some characteristics of workplaces with financial participation. • Separates manufacturing firms into those with cash participation, share participation or both and those with no participation. • Key results on the effects of various variables on the probability that a firm is in each of these groups 1. Size insignificant 2. HRM(personnel specialist at the workplace) weakly negative 3. Share participation significantly more likely for multi-establishment firms 4. Less likely in workplaces using advanced automated machinery. 5. Union density insignificant 6. Union recognition significant + positive. 7. Significant negative association with quit rate
Prendergast (1992)	• Constructs theory as to how firms provide workers with incentives to collect firm-specific human capital when the skills cannot be contracted upon and the worker is rewarded by promotion. • 2 Scenarios: 1. Firm has private information on the workers promotion prospects 2. Symmetric uncertainty • Notes that in Japan, highfliers are selected a lot later than in USA and this could be due to incentive effects. Extended cohort equality motivates workers by allowing each to believe he has good promotion prospects. • Both USA and Japanese practices are shown to be optimal responses to the different labour market conditions in the two countries. • There are fewer opportunities for mid career quitters in Japan and hence less renegotiation of contracts. The firm can therefore intensively train the less able worker to make the promotion contest closer and provide incentives for each worker to collect firm-specific human capital. • The firm's optimal policy depends on the returns to training workers of different ability and the costs of signalling information to the worker.
Prendergast (1999)	• Purpose: To critically overview existing work on the provision of incentives in firms. 1. How do firms design compensation contracts to efficiently align the disparate interests of the workers with itself? Maybe: piece rates, options, discretionary bonuses, promotions, profit sharing, efficiency wages, deferred compensation..... 2. Do individuals respond in the predicted way? 3. Do firms write contracts with these responses in mind? • Group incentive schemes are lower powered than individual ones owing to free riding but empirically they do, in fact, improve productivity on average. • Career concerns provide incentives due to contracts being renegotiated over the work life. Employee's effort affects the signal informative of his expected future

productivity.

Incentive Structure and Outcomes

- Recent evidence suggests that there are strong responses of output to the use of PRP contracts.
- Lazear (1996) shows that productivity increased by 35%, wages incerased by 12%. Approximately 1/3 is attributible to selection effects; the less able left the firm ands more talented people replaced them.
- Paarsch and Shearer (1996) show that wages rise by 6%, a lower bound for productivity gain from piece rates. Upper bound is raw productivity differential of 35%. A structural model is used to account for contract selection effects (the weather) to show that a plausible estimate of the gains from using piece rates is about 10%.

Multi Tasking and Side Effects

- Both objective and subjective assessments give rise to biases. Objective assessments cause to much effort to be diverted to the easily measurable tasks. Subjective assessment gives rise to "leniency bias" where supervisors are reluctant to give bad ratings to workers, "centrality bias" where ratings are overly compressed. There is also an incentive to bias effort towards currying favour with one's supervisor.

Objective measurement bias

- Theoretical work is Baker (1992), Holmstrom and Milgrom (1991).
- Where an evaluation is taken at a particular point in time, agents change their work patterns in response to the contemporaneous position between the evaluation points.
- Asch (1990) shows that navy recruiters bias their efforts towards the time immediately before the cut-off date for bonuses.
- Healy (1985), Oyer (1997), Courty and Marschke (1997) and Leventis (1997) show that quota schemes lead to behaviour varying according to whether the quota has been exceeded or how far away the agent is from acheiving the quota. Leventis (1997) shows that New York surgeons take on less risky cases as they approach a mortality threshold above which they are penalised. Oyer (1997) also shows that there is greater variability in sales at the end of the financial uear than at any other time.
- Chevalier and Ellison (1997) show that fund managers change the riskiness of their activities in response to incentives. Agents are rewarded based on the assets they control which vary from year to year according to the previous year's performance. The variation is non-linear in performance however. Over some regions there is an incentive to take too little risk and others too much. Fundmanagers do respond to these incentives and hence there is a divergence between privately optimal and socially optimal behaviour.

Subjective measurement bias

- Leniency and centrality biases: Landy and Farr(1980), Mohrman and Lawler (1983), Murphy and Cleveland (1991) and Larkey and Caulkins (1992) all document negligible difference in ratings and compensation across workers. This reduces the value of subjective assessments as a means of providing incentives.
- Rent seeking biases: Theoretical work by Holmstrom (1982), Milgrom (1988), Milgrom and Roberts (1988), Tirole (1992) and Allen and Gale (1992).
- Brown (1990) shows that jobs with a variety of duties reduce the likelihood of piece rate pay. Macleod and Parent (1998) show that piece rate jobs typically involve few tasks, while those with many tasks are characterised by subjective assessments of performance.
- Lamenting the focus on CEOs, fundmanagers and professional golfers, "it seems to me that a critical avenue for future research should be to better understand the evaluation and compensation of those with noncontracted output."

Tournaments

- Gibbs and Hendricks (1996) show that there is little pay variation within grades,

instead most pay increases occur with promotion to a new job (title).

- Theory is Lazear and Rosen (1981) which shows that tournaments incentivise efficient effort levels.
- Do tournament incentives matter? Ehrenberg and Bognanno (1990) show that golfers' performance improves when there is more at stake. Becker and Huselid (1992) repeat this result for professional NASCAR drivers. Knoeber and Thurman (1994) repeat result for broiler chicken farmers who are subject to relative performance evaluation.
- Does prize increase with number of competitors? Main, O'Reilly and Wade (1993), Eriksson (1996) and Conyon and Peck (1997) confirms this prediction for number of people in rank immediately below CEO.
- Do agents with a lower chance of winning undertake riskier strategies? Knoeber and Thurman (1994) provide support to this prediction showing that variance of performance decreases with proven grower ability. Becker and Huselid (1992) show that the absolute prize spread increases risky behaviour.

Side effects

- When agents are evaluated relative to each other then there are dysfunctional incentives to sabbotage rather than help one's colleagues. Drago and Garvey (1997) provide evidence from the Australian manufacturing sector such that where promotion incentives are reported to be strong, they are less likely to let others use their equipment, tools or machinery.
- A different approach is to offer promotions according to rigid rules such as age. Incentives are lower powered but there is less disfunctionality/lower cost of assessment in the same way as with PRP.

Why are tournaments used?

- An important function of promotions is in sorting workers into jobs as well as providing effort incentives. Theory: Rosen (1982); Sattinger (1993). But "...we know relatively little about how internal labor markets, which must assign workers to tasks in firms based on comparative skills, interact with the provision of incentives for workers."
- Carmichael (1983): Because the firms could lower performance assessments to pay lower wages, workers may not respond to non-fixed award schemes. A relative prize structure provides a commitment.

Bureaucracy

- Rules are often the basis of resource allocation in organisations. Freeman and Medoff (1984) show that seniority plays a significant role in promotion and layoff decisions independent of profitability considerations. Among non-union firms, they note that 42% lay off solely on the basis of seniority while a mere 14% ignore seniority.
- Spilerman and Ishida (1994), BGH (1994) and Gibbs and Hendrick (1996) all show that there are rigid salary ranges within grade. These pay restrictions have real effects. Spilerman (1986) also notes that minimum experience times are required before promotions independent of ability.
- In each of these cases discretion is taken away from immediate supervisors and centralised. Such rules are ex-post inefficient yet may well be ex-ante efficient by removing incentives for influence activities.

Team Production

- Where compensation is distributed according to the output of a group, rather than an individual, there is an incentive to free-ride on colleagues' efforts. Theory: Holmstrom (1982); McClaughlin (1994).
- Newhouse (1973) shows that when the fraction of revenues that are shared with others rises in a medical practice: (i) overhead costs rise; (ii) doctors work fewer hours. Similarly, Leibowitz and Tollison (1980) find that larger law partnerships suffer from worse cost containment. These studies do not, however, address the issue of contract selection.

- Gaynor and Pauly (1990) use survey evidence on medical group practices to find that performance is worse when compensation is shared with others. Here, reported risk aversion is used to exogenously identify practice size. This measure is independent of productivity and has explanatory power. The performance effect of the compensation form is hence legitimately identified.
- Peer pressure has been advocated as a solution to the free-rider problem. Theory: Kandel and Lazear (1992).
- Weiss (1987) and Hansen (1997) consider the effect of team based compensation on individual productivity. In both cases, individual productivity measures are available both to the firm and to the econometricians yet the firm chooses to pay according to team performance. Weiss studies blue collar workers in a pharmaceutical company; Hansen studies telephone operators in a financial services company. Both studies find that the worst performers on individual based schemes improved their performance whilst the best workers' performance deteriorated. Weiss identifies that the effect on turnover is U-shaped across the ability range. The mid-performing are most likely to stay.
- Kruse (1993) analyses the effect of profit sharing on performance. Using a fixed effects panel model, firms adopting profit sharing are compared against non-adopting firms from three years before initiating to three years after initiating the scheme. Firms with profit sharing are found to experience 3% higher productivity growth. This is favourable support for the positive effect of profit sharing however the trends may be different to start with. Further examination of the three years prior ot initiation shows that those that adopted profit sharing were already experienceing higher productivity growth.
- Another problem with the profit sharing literature is that it ignores the fact that wages are generally higher in companies with such a scheme and hence better workers may be selected and motivated according to efficiency wage theory.

Efficiency Wages

- Workers are paid above their reservation utility level in order to induce effort exertion. Theory: Shapiro and Stiglitz (1984); Raff (1992); Acemoglu and Newman (1997). According to the theory wage rents and proportion of supervisors ought to be substitutes.
- Groshen and Krueger (1990) test this proposition using hospital employee data and find supporting evidence. However this evidence does not prove efficiency wage theory since the same result can be derived from the classical moral hazard model whereby more supervisors reduces noise and hence risk. Efficiency wages also predicts higher turnover with more supervisors.

Deferred Compensation

- When agents stay with a firm for a long period there is no necessary reason why they should be paid their marginal product at each period. Instead the agent could be paid better in some periods than in others. Deferring compensation from new to old increases the incentive to stay at the job. In essence, this is a dynamic efficiency wage theory. Theory: Lazear (1981)
- Freeman and Medoff (1984) and Spilerman (1986) both illustrate that firms often build seniority provisions into pay, promotion and retention decisions independent of productivity. Medoff and Abraham (1980) show that the performance evaluations of senior workers are no higher than their more junior counterparts yet their wages are significantly higher.
- Another approach to assertaining whether firms defer compensation is to compare employees with self-employed workers. The self employed person's earnings should be a good proxy for the productivity of both of them. Lazear and Moore (1986) find that self employed earnings profiles are indeed flatter than employees'.

Dynamic Renegotiation of Contracts:
Career concerns

	• Theory: Fama(1980); Holmstrom (1982). • Gibbons and Murphy (1992) test for CEOs the prediction that workers with longer tenure ought to be more subject to PRP than younger workers due to their having diminished career concerns. This prediction is supported. Gompers and Lerner (1994) find similar support with respect to venture capital managers. • Stein (1990) and Paul (1992) address how career concern models predict myopia where agents care excessively about short term returns instead of net present value. ***Dynamic Enforcement of Contracts*** • Bull (1987) and MacLeod and Malcomson (1989) illustrate that with sufficiently high discount factors, repetition can generate efficient outcomes that would not arise in a statis setting. (MacLeod (1993) and Malcomson (1998) survey this literature) **Conclusions** 1. Agents respond to incentives 2. Free-riding occurs in teams 3. Badly set incentives lead to dysfunctional behaviour 4. Tenure has a significant influence on pay independent of productivity 5. Identification problems: Correct theories have not been properly identified because a number of competing theories are consistent with the facts. Identification of the effects of different incentive schemes is difficult because of the unobserved differences leading to opposing contract selection. 6. Too much emphasis has also been placed on CEOs and easily measurable jobs.
Rosen (1988)	**The Limits of Markets** • If the spontaneous coordination of decisions through markets is efficient, why should non-market allocations ever be observed? Coase explained the existence of firms via the transactions cost of decision making, such that authoritarian decisions by managers subject to no transaction cost substitute for more decentralised market coordination. Firm size is limited by ultimate diseconomies of centralisation due to specialisation and division of labour within it. When the market mechanism is abandoned, information, specific knowledge, decisions and actions must be pooled by some other means. • The interaction of production technology and intra firm organisation determines the efficiency of non-market decision making. An internal organisation must accomplish two things: 1. First, it must coordinate and harmonise different interests and preferences among individual members who have their own self-interests and points of view. The organisation must be structured to subordinate these self-interests and align them with the missions of the organisation as a whole. 2. Second, the organisation must discover the abilities, motivations and talents of its members in order to assign people to alternative positions of rank and authority within it. Job assignments are inherently indivisible: all slots must be filled and there is competition for them within the organisation. • There are two theories to deal with the problem of incentive alignment within organisations: 1. Transfer pricing theory. This approach mimics the market. Begs the question of the firm's rationale to be integrated. 2. Agency theory. Get someone to do something for you by designing reward + punishment contract to align her incentives with your own. **Firm Structure** • Hierarchical structures economise managerial resources by subordinating certain decisions and monitoring functions through a chain of command and a span of control at each link of the chain. • In a hierarchy, top-management decisions affect worker productivity all down the chain, hence marginal increment to ability has far greater value at higher levels. The

	most able workers therefore should be in charge of the largest (sub-)organisation. Ignoring effort and assuming a competitive labour market with perfect information about worker ability, each worker will be paid her marginal product and the compensation of CEOs will be positively correlated with firm size, as is observed. **Promotions, Elections and Other Contests** • Contests are different from markets in that they provide a mechanism to reach discreet decisions that categorise indivisible objects into mutually exclusive classes. With respect to the selection problem considered, contestants must be ordered in some way. Examples of such contests are: 1. Examinations 2. College admission 3. Quality control. 4. Medical trials - testing drugs to see which is best. 5. Elections 6. Litigation 7. Auctions • In general, a contest is any instance where there are many competing for few of whatever. That is, it is *sorting* mechanism. Most research into the firm has focussed on alignment of incentives as a solution to the moral hazard problem not the adverse selection one. **Summary of Theoretical Results on Contests** • For a strategy equilibrium to exist there must be a given degree of uncertainty over outcomes. • In symmetric ability tournaments, there exists a symmetric equilibrium effort input from each agent that is increasing in the absolute spread of the prize structure and decreasing in the variance of the random component of output. • For heterogeneous ability of contestants, the more able have a greater chance of winning in equilibrium, yet where ability is symmetrically unknown, the equilibrium effort is symmetric. In sequential contests ability is revealed progressively each round. If ability is known effort is reduced when there is a large gap between high and low since the low ability have less chance of winning and hence exert less effort. This, in turn, causes the high ability group to exert less effort as well. • There exists an optimal prize distribution for both homogeneous contestant pool and heterogeneous pool with symmetric progressive information revelation through the stages of the sequential tournament.
Schmidt (1997)	• Derives the optimal incentive scheme for a manager as a function on the degree of competition in the output market in which his firm operates. **Background literature** • A standard view is that in a perfectly competitive product market, there is no scope for slack since a firm operating sub optimally will be driven out of the market. Leibenstein identifies that there will be X-inefficiency in imperfectly competitive markets where X-inefficiency measures the degree to which actual profits depart from the maximum that could potentially be obtained if all operations were to be carried out at minimum cost. Jensen and Meckling (1976) counter this argument by suggesting that agency costs are independent of the degree of competition and, since managers not owners benefit from managerial slack, competition ought to have no effect on the choice of incentive scheme. • Competition may affect the choice of incentive scheme however due to the fact that additional performance information may be available. Holmstrom (1982) and Nalebuff and Stiglitz (1983) argue for the role of Relative Performance Evaluation (RPE) Where productivity shocks are correlated across certain firms, the additional information provided by the performance of these firms can be used to increase the power of the

incentives in the manager's contract without exposing him to more risk.

- Hart (1983) presents a hidden information model in which common shocks are transmitted via the market price and each managers wage depends only on the profits of his own firm. In this model competition unambiguously reduces managerial slack. This result depends crucially on the utility function of the manager however. Hart assumes infinitely risk averse managers. Scharfstein (1988) shows that Hart's result is reversed when managers marginal utility from income is strictly positive. Competition here actually increases managerial slack. In a hidden action model, Hermalin (1992) confirms that the informational effect of competition on managerial incentives is ambiguous.

The Model

- The principal designs a contract for the manager $[w^H, w^L]$ which induces him to choose an effort level corresponding to a probability that costs $[c^H, c^L]$ will be reduced from high to low.
- Manager then chooses an effort level p with cost G(p).
- The cost outcome is realised.
- Wage is paid and liquidation decision is made.
- Assume that profits are strictly higher in the low cost state and are always positive in this state. The principal is assumed to liquidate the firm if profits are negative.
- The degree of competition is defined according to it's relationship to profit. That is, ***the higher the degree of competition, the lower the profit in each cost realisation***.
- Liquidation is assumed to incur a fixed cost to the manager. His expectated probability of liquidation is $l(\phi)$ if a high cost is realised.
- Note that the effect of competition on the marginal increment to profit owing to an increase in p is undetermined.

Results

- The optimal compensation scheme always pays a wage = 0 in a high cost realisation.
- The effect of increasing competition is to reduce profits in both cost states and hence make it more likely that the firm will liquidate in a high cost state. There are several possible effects of this on the low cost wage payment:
    1. Threat of liquidation effect:
        a) Participation Constraint (PC) does not bind: The larger is the probability of liquidation to the manager the lower is the incentive bonus required to induce him to work and hence the lower is the incentive bonus.
        b) PC binds: The manager must be offered a higher bonus to induce him to take on the contract in the first place.
    2. Value of cost reduction effect:
        a) The effect on the principal's benefit from inducing this high effort, $\partial\pi^L/\partial\phi - \partial\pi^H/\partial\phi$, is ambiguous. If the effect of increasing competition is to make the marginal increment to profit owing to increasing effort higher, then the principal will be prepared to pay a higher rent and a larger incentive bonus. May even make the participation constraint non-binding. This has no effect, however, if the participation constraint is firmly bound.
- The above results imply 2 sufficient conditions for increased competition to lead to higher managerial effort:
    1. PC is binding
    2. The value of a cost reduction effect is non-negative with respect to increasing competition.
- An extension to the basic model introduces a cost to reorganisation. Assume the workforce earns a rent from keeping the status quo which is lost if costs are lowered. Suppose further that the workforce also incurs an additional loss if the firm is liquidated. In this scenario, the result is derived that managers will be paid a fixewd wage if there is little competition and the optimal contract described above if there is competition. The higher the probability of liquidation (and concommitantly, the degree

	of competition), the more the workforce will be willing to reorganise and hence the higher the value of an incentive bonus in terms of inducing managerial effort. • In a recession, reorganisation leading to cost reductions is more likely because the threat of liquidation and it's probability increase. Recession can be interpreted as an increase in competition. This has an effect on both the manager and the workforce. The workforce is more willing to accept reorganisation and the manager is more willing to exert effort. • Sunk costs: Where the costs to be reduced by the manager are sunk costs and PC is not binding, using a Cournot oligopoly model, it is shown that effort increases with competition. This is because the probability of liquidation still increases with competition. • Price-cap regulation: The tighter the price cap, the higher the marginal reduction in profits owing to a failure to reduce costs. The principal will introduce stronger incentives for the manager in this case who will, in turn, exert more effort to reduce costs. It is more likely that PC will be non-binding when there is a tighter price cap. These results hold independently of the probability of liquidation. • It is also shown that, starting from the case of a monopoly, the effects of increasing the number of competitors first increases managerial effort but then decreases once competition becomes too intense. The strongest incentives to reduce costs hence may be imposed by an oligopoly environment with few competitors. This result is derived from a model of Bertrand competition with an increasing number of competitors.
Slade (1996)	• Where agents engage in many tasks, the characteristics of one task can affect the optimal payment method for the other type in predictable ways. This paper analyses the problem empirically using contracts between 96 oil companies and their branded service stations in Vancouver. • Contracts range from full integration to arms length transactions. The principle question asked is: Given that a firm wants to operate a petrol station under contract, what determines the form of this contract? • Variable of interest is the degree of complementarity between tasks. Tasks are: 1. Selling petrol 2. Selling convenience store goods 3. Repairing cars. • Complementarity is composed of three elements: 1. High cross-price elasticity of demand 2. High covariance of shocks 3. Low effort substitutability • Maintained hypothesis is that convenience shops have higher complementarity with gasoline sales than do repairs in all three elements. • Theoretical model used is derived from Holmstrom and Milgrom (1991). An optimal "bonus" coefficient is derived . This is tailored to the petrol retail industry by letting one activity be an outside activity from which the agent extracts all residual income. • Key theoretical results: 1. A high degree of demand and risk complementarity is associated with lower powered incentives. That is, a higher wage component, s, and a smaller primary output coefficient, b_1. Intuition - When the cross-price demand effect is large, greater effort in the primary activity reduces revenues in the secondary activity by a larger amount. The increase in risk that accompanies a higher b_1 , however, is independent of the cross-price elasticity of demand. 2. When random shocks are highly correlated, b_1 is lower since positive correlation increasses the risk that the agent faces and hence insurance becomes more desirable. In contrast, negative correlation allows the agent to diversify her risk. 3. The effect of an increase in effort substitutibility on b_1 is ambiguous. It depends on the level of b_1 to start with.

	4. The above results lead to the expectation that petrol stations with convenience shops are more likely to have contracts biased towards wages than petrol stations with repair shops. Also, when comparing one task with two task petrol stations, we would expect the one-task station to be more likely to operate under a contract biased towards wages if the alternative 2nd task is repairs but to be biased towards residual claiming when the alternative 2nd task is convenience goods retailing. • Four types of contract can be gleaned from the 96 petrol stations in Vancouver: 1. Company operated / direct stations. Manager is a salaried employee and owns no assets. (8 in sample) $s^1>0$; $b_1^1 = b_2^1 = 0$ 2. Commissioned-agent stations. Oil company owns forecourt and all gasoline revenues. Agent is paid a salary and a small commission on gas sales. The 'backcourt' consists of all other operations: convenience store, repair shop, car wash. These assets are owned by the agent who pays a small commission on so-generated revenues. (53 in sample) $0<s^2<s^1$; $b_1^2>0$; $b_2^2 \approx p_2$ 3. Lessee-dealer stations. Oil company owns land, agent owns backcourt assets. Agnet buys oil at a wholesale price and retains residual. Agent pays rent to oil company. (31 in sample) $s^3 < 0$; $b_1^3 > b_1^2$. 4. Dealer-owned stations. Agent owns all assets and generally retains all surpluses. (4 in sample) $s^4 = 0$; $b_1^4 \approx b_1^3$; $b_2^4 \approx p_2$ • As we move from type 1 through to type 4, agent asset ownership increases and incentives become higher powered. • Uses a Spearman rank correlation co-efficient test using TYPE as a [1,2,3,4] ordered-qualitative variable representing the above four types of contract and hence increasing in power of incentives. [NB Spearman rank coefficients are unconditional and could hence be spurious]. Results: 1. Hours open coefficient is significantly negative. 2. Volume sold coefficient is significantly negative. 3. No. of service bays coefficient is significantly negative. 4. Self-service dummy coefficient is significantly negative. 5. Average TYPE is 2.91 for stations with repairs, 1.80 for stations with convenience shops, 2.04 for gasoline sales only. 2.91 is significantly different from 2.04 at 1% level. • A probit model is also set up. The dependent variable = 1 if contract type 3; =0 if contract type 2. (The other two are excluded - there aren't many of these anyway) This yields the following results: 1. Significance of volume disappears after controlling for other station characteristics. [we would expect, if anything, higher powered incentives to be associated with higher, not lower, sales volume.] 2. Normalised success ratio, indicating proportion of correct predictions ranges between 71% and 80% for the selection of specifications. • Conclusion: Lessee dealerships (Type 3) are more likely to have service bays than commissioned agencies (Type 2). The results generated by this work unambiguously support the theoretical results predicted using the Holmstrom-Milgrom model. That is, for agents performing 2 tasks, the more complementary are the tasks, the lower powered will be the incentives in the compensation contract.
Spurr and Barber (1994)	• Uses data on minor league baseball to show that the more that pitchers' performance deviates from the mean of their league, the sooner they will be promoted or relegated.(via transfer) to another league.
Topel (1991)	• Argues that wages increase with job tenure, ie rise relative to alternatives, and that this is not necessarily solely due to the accumulation of specific human capital but is

	significantly attributable to the career path that *leads* to a good match. Hence investment in human capital is predominantly general rather than specific. • It is shown, in contrast to Abraham and Farber(1987) and Altonji and Shakotko(1987), using the same data, that wages do rise with seniority. Abraham and Farber and Altonji and Shakotko's results are shown to be erroneous due to mistakes in their methodology. A key mistake is that the data on tenure in the PSID is inconsistent in that it doesn't increase by one for every additional year in the same job. The year to year changes range from -31 years to 7.5 years. Topel corrects for this. • A lower bound is calculated for the true returns to tenure: Ceteris paribus, a ten year increase in tenure raises the wage of the typical worker by over 25%.
Topel and Ward (1992)	• Uses LEED from 1957 to 1972 (quarterly data) to trace the pattern of early careers with regard to the motivation for the observed frequent job changes. • Key results: 1. Average frequency of job change is a decreasing function of tenure 2. Over 1/3 wage growth over first 10 years in labour force can be attributed to job changing 3. More durable jobs are associated with greater wage growth 4. Wage growth is lower in periods leading up to the end of the job 5. The evolution of earnings within jobs is approximately a random walk with drift • Results consistent with learning hypothesis
Van Audenrode and Leonard (1998)	• Examines whether pay policy affects productivity • Uses LEED data: 695 large Belgian firms between 1985 and 1985. • Key results: 1. For blue/white collar, large/small firm, within and across industries and controlling for capital per worker, it is consistently found that firm labour productivity and total factor productivity are positively correlated with wage levels, the steepness of the age-earnings profile, profiles that turn down less after their peak and pay inequality across occupations and sexes. 2. Wage level and profile steepness are very strongly negatively correlated with employee turnover • Also: 3. Pay differentials by age are more compressed in larger firms 4. Pay inequality widened significantly over the sample 5. Pay is persistent 6. Wage level (intercept) is positively correlated with the return to experience (steepness of slope)
Wilson and Peel (1991)	• Examines the effect on absenteeism and quit rates of employee participation schemes, such as labour-management joint decision making and union presence, and of profit sharing and employee share ownership. • Data is on 52 engineering and metal working firms in UK in 1983-84 • Key results: 1. Firms with profit sharing and/or employee share ownership had significantly lower absenteeism and quit rates. (Very robust finding) 2. A high degree of worker participation in decision making is significantly associated with lower quit rates but the effect on absenteeism is ambiguous 3. Using "seemingly unrelated regression" techniques, limited evidence suggests that absenteeism and quit rates have common roots.

References

Abowd, J. (1990) “Does performance based managerial compensation affect corporate performance”, *Ind. Lab. Relat. Review,* 43, pp. 52-74

Abraham, K. and H.Farber (1987), “Job duration, seniority and earnings”, *American Economic Review,* 77, 278-97

Acemoglu, D. and J.-S. Pischke (1996), “Why do firms train? Theory and Evidence”, NBER Working Paper 5605

Altonji, J. and N.Williams (1997) “Do wages rise with job seniority? A reassessment”, NBER Working Paper, 6010

Altonji, J. and R.Shakotko (1987) “Do wages rise with job seniority?” *Review of Economic Studies,* 54, pp.437-59

Anderson, K., R.Burkhauser & J.Raymond (1993), “The Effect of Creaming on Placement Rates Under the Job Training Partnership Act”, *Ind. Lab. Relat. Rev.* 46, pp. 613-25

Antle, R. and A.Smith (1986), “An empirical investigation of the relative performance evaluation of corporate executives”, *Journal of Accounting Research* , 24, pp.1-39

Asch, B. (1990) “Do incentives matter? The case of Navy recruiters”, *Ind. Lab. Rel. Review,* 43, pp.89-107

Baker, G. (1992) “Incentive contracts and performance measurement”, *Journal of Political Economy,* 100, pp.598-614

Baker, G., R.Gibbons and K.J.Murphy (1994) “Subjective performance measures in optimal incentive contracts”, *Quarterly Journal of Economics,* 109, pp.1125-56

Baker,G., M.Gibbs and B.Holmstrom (1994a) “The internal economics of a firm: Evidence from personnel data”, *Quarterly Journal of Economics,* 109, pp.881-921

Baker, G.,M.Gibbs and B.Holmstrom (1994b) “The wage policy of a firm”, *Quarterly Journal of Economics*, 109, pp.921-57

Barron, J., D.Black and M.Loewenstein (1989) “Job matching and on-the-job training”, *Journal of Labor Economics*, 7, pp.1-19

Beaudry, P. and J.Di Nardo (1991) “The effect of implicit contracts on the movement of wages over the business cycle: Evidence from micro data”, *Journal of Political Economy*, 99, pp.665-89

Becker, B and M.Huselid (1992) “The incentive effects of tournament compensation systems”, *Administrative Science Quarterly*, 37, pp.336-50

Bjerke, D, J.Cleveland, R.Morrison & W.Wilson (1987), “Officer Fitness report Evaluation Study”, Report TR88-4, Navy Personnel research and Development Center

Black, S. and L.Lynch (1997) “How to compete: The impact of workplace practices and information technology on productivity”, NBER, 6120

Booth, A. and J.Frank (1999) “Performance related pay”, *Journal of Labor Economics*, 17, pp.447-63

Brown, C. (1990) “Firms’ choice of method of pay”, *Ind. Lab. Rel. Review*, 43, pp.165-183

Brown, C. (1992) “Wage levels and methods of pay”, *Rand Journal of Economics*, 23, pp.366-75

Brown, C. and P.Philips (1986) “The decline of piece rates in California canneries”, *Industrial Relations*, 25, pp.81-90

Brown, J. (1989) “Why do wages increase with tenure? On the job training and life cycle wage growth observed within firms”, *American Economic Review*, 79, pp.971-92

Bruderl, J., A.Diekmann and P.Preisendorfer (1991) “Patterns of intraorganizational mobility: Tournament models, path dependancy and early preomotion effects”, *Social Science Research*, 20, pp.197-216

Bull, C. (1987) “The existence of self-enforcing wage contracts”, *Quarterly Journal of Economics*, 102, pp.147-59

Bull, C., A.Schotter and K.Weigelt (1987) “Tournaments and piece rates: An experimental study”, *Journal of Political Economy*, 95, pp.1-33

Burgess, S. and P.Metcalfe (1999) “The use of incentive schemes in the public and private sectors: Evidence from British establishments”, CMPO

Burgess, S. and H.Rees (1997) “Transient jobs and lifetime jobs: Dualism in the British labour market”, *Oxford Bulletin of Economics and Statistics*, 59, pp.309-29

Chang, Ca. and P.Miller (1996) “The incentive effects in the Australian labour market: An application of the Lazear and Moore model.”, *Australian Economic Papers*, 35, pp.114-131

Chevalier, J. and G.Ellison (1997a) “Risk-taking by mutual funds as a response to incentives”, *Journal of Political Economy*, 105, pp.1167-1200

Chevalier, J. and G.Ellison (1997b) “Career concerns of mutual fund managers”, University of Chicago

Chiappori, P-A., B.Salanie and J.Valentin (1998) “Early starters vs late beginners”, INSEE

Coughlin, A. and C.Narasimhan (1992) “ An empirical analysis of sales force compensation plans”, *Journal of Business*, 65, pp.93-123

Courty, P. & J.Marschke (1997), “ Measuring Government Performance: Lessons from a Federal Job-Training Program”, *American Economic Review*, 87, pp.383-88

Courty, P. and J.Marschke (1999) “ An empirical investigation of gaming responses to performance incentives”, London Business School

Cragg, M. (1997) “Performance incentives in the public sector: Evidence from the Job Training Partnership Act”, *Journal of Law, Economics and Organisation*, 13, pp.147-168

Dewatripont, M, I.Jewitt and J.Tirole (1999a) “The economics of career concerns, part 1: Comparing information structures”, *Review of Economic Studies*, 66,

Dewatripont, M, I.Jewitt and J.Tirole (1999b) “The economics of career concerns, part 2: Application to missions and accountability of government agencies”, *Review of Economic Studies*, 66

Dixit, A. (1997) “Power of incentives in private vs public organisations”, *American Economic Review* Papers and Proceedings, 87, pp.378-82

Drago, R. and G.Garvey (1998) “Incentives for helping on the job:Theory and evidence”, *Journal of Labor Economics*, 16, pp.1-25

Drago, R. and J.Heywood (1995) “The choice of payment schemes: Australian establishment data”, *Industrial Relations*, 34, pp.507-531

Dustmann, C. and C.Meghir (1998) “Wages, experience and seniority”, UCL

Ehrenberg, R. and M.Bognanno (1990) “The incentive effects of tournaments revisited: Evidence from the European PGA tour”, *Ind. Lab. Rel. Review*, 43, pp.74-89

Encinosa III, W., M.Gaynor and J.Rebitzer (1997) “The sociology of groups and the economics of incentives”, NBER Working Paper 5953

Farber, H. (1994) “The analysis of inter- firm worker mobility”, *Journal of Labor Economics*, 12, pp.554-94

Fernie, S. and D.Metcalf (1995) “Participation, contingent pay, representation and workplace performance: Evidence from Great Britain”, *British Journal of Industrial Relations*, 33

Fernie, S. and D.Metcalf (1996) “It’s not what you pay it’s the way that you pay it: Jockeys’ pay and performance”, *CentrePiece Magazine*, 2, June 1996

Fernie, S. and D.Metcalf (1998) “(Not) Hanging on the telephone: Payment systems in the new sweatshops”, LSE Working paper 891

Flabbi, L. and A.Ichino (1998) “Productivity, seniority and wages”, CEPR discussion paper 1966

Freeman, R. and M.Kleiner (1998) “The last American shoe manufacturers: Changing the method of pay to survive foreign competition”, NBER Working Paper, 6750

Garen, J. (1994) “Executive compensation and principal-agent theory”, *Journal of Political Economy*, 102, pp.1175-99

Gaynor, M. and M.Pauly (1990) “Compensation and productive efficiency in partnerships: Evidence from medical group practice”, *Journal of Political Economy*, 98, pp.544-74

Gibbons, R. (1996), “Incentives and Careers in Organisations”, NBER Working Paper 5705

Gibbons, R. (1998), “Incentives in Organisations”, NBER Working Paper 6695

Gibbons, R. and K.J.Murphy (1992) “Optimal incentive contracts in the presence of career concerns”, *Journal of Political Economy*, 100, pp.468-506

Gibbons, R. and K.J.Murphy (1990) “Relative performance evaluation for chief executive officers”, *Ind. Lab. Rel. Review*, 43, pp.30-52

Gibbons, R. and M.Waldman (1999) “Careers in Organisations”, in *Handbook of Labor Economics*, vol.3, O.Ashenfelter and D.Card (eds), North-Holland, Amsterdam

Gibbs, M. (1995) “Incentive compensation in a corporate hierarchy”, *Journal of Accounting and Economics*, 19, pp.247-77

Gibbs, M. and W.Hendricks (1997) “ Are administrative pay systems a veil?”, Society of Labor Economists Conference Paper, May 2-3 1997

Goldin, C. (1986), "Monitoring Costs and Occupational Segregation by Sex", *Journal of Labor Economics*, 4:1, pp.1-27

Gore, A. (1995) *Common Sense Government* Random House, New York

Groot, W. and H.Oosterbeek (1995) "The incidence and wage effects of incentive pay"

Groshen, E. and A.Krueger (1990) "The structure of supervision and pay in hospitals", *Ind. Lab. Rel. Review*, 43, pp.S134-47

Hall, B. (1998) "The pay to performance incentives of executive stock options", NBER Working Paper, 6674

Hall, B. and J.Liebman (1997) "Are CEOs really paid like bureaucrats?", NBER Working Paper, 6213

Heckman, J., J.Smith and C.Taber (1996) "What do bureaucrats do? The effects of performance standards and bureaucratic preferences on acceptance into the JTPA program", NBER Working Paper, 5535

HMSO (1999) "Modernising Government", White Paper, HMSO, London

Holmstrom, B. (1982a) "Moral hazard in teams", *Bell Journal of Economics*, 13, pp.324-40

Holmstrom, B. (1982b) "Managerial incentive problems: A dynamic perspective" in *Essays in honour of Lars Wahlbeck*, Helsinki, Finland

Holmstrom, B. and P.Milgrom (1987) "Aggregation and linearity in the provision of intertemporal incentives", *Econometrica*, 55, pp.303-28

Holmstrom, B. and P.Milgrom (1991) "Multi-task principal-agent analyses: Linear contracts, asset ownership and job design", *Journal of Law, Economics and Organisation*, 7, pp.24-52

Holmstrom, B. and P.Milgrom (1994) "The firm as an incentive system", *American Economic Review,* 84, pp.972-991

Holzer, H. (1990) “The determinants of employee productivity and earnings”, *Industrial Relations*, 29, pp.403-22

Hutchens, R. (1987) “ A test of Lazear’s theory of delayed payment contracts”, *Journal of Labor Economics*, 5, pp.S153-S170

Ichniowski, C., K.Shaw and G.Prennushi (1995) “The effect of human resource management practices on productivity”, NBER Working Paper, 5333

Itoh, H. (1992) “Cooperation in hierarchical organisations: An incentive perspective”, *Journal of Law, Economics and Organisation*, 8, pp.321-45

Jensen, M. and K.J.Murphy (1990) “Performance pay and top management incentives”, *Journal of Political Economy*, 98, pp.225-64

Jones, D. and T.Kato (1995) “The productivity effects of employee stock-ownership plans and bonuses: Evidence from Japanese panel data”, *American Economic Review*, 85, pp.391-415

Kahn, L. and P.Sherer (1990) “Contingent pay and managerial performance”, *Ind. Lab. Rel. Review*, 43, pp.107-21

Kandel and Lazear (1992) “Peer pressure and partnerships”, *Journal of Political Economy*, 100, pp.801-817

Kaplan, S. (1994) “Top executive rewards and firm performance: A comparison of Japan and the United States”, *Journal of Political Economy*, 102, pp.510-46

Kerr, S. (1975) “On the folly of rewarding A while hoping for B”, *Academy of Management Journal*, 18, pp.769-783

Knoeber, C. and W.Thurman (1994) “Testing the theory of tournaments: An empirical analysis of broiler production”, *Journal of Labor Economics*, 12, pp.155-79

Krueger, A. (1991) “Ownership, agency and wages:An examination of franchising in the fast-food industry”, *Quarterly Journal of Economics*, 106, pp.75-101

Kruse, D. (1991) “Profit-sharing and employment variability: Microeconomic evidence on the Weitzman theory”, *Ind. Lab. Rel. Review*, 44, pp.437-453

Lambert, R., D.Larcker and K.Weigelt (1993) “The structure of organisational incentives”, *Administrative Sciences Quarterly*, 38, pp.438-61

Lazear, E. (1981) “ Agency, earnings profiles, productivity and hours restrictions” *American Economic Review*, 71, pp.606-20

Lazear, E. (1984) “Incentives and wage rigidity”, *American Economic Review*, 74, pp.339-44

Lazear, E. (1986) “Salaries and piece rates”, *Journal of Business*, 59, pp.405-431

Lazear, E. (1989) “Pay equality and industrial politics”, *Journal of Political Economy*, 97, pp.561-80

Lazear, E. (1998a) “Performance pay and productivity”, Stanford University

Lazear, E. (1998b) “Personnel economics”, MIT Press, 3rd edition

Lazear, E. (1998c) “Personnel economics for managers”, John Wiley and Sons

Lazear, E. (1999) “Personnel economics: Past lessons and future directions”, *Journal of Labor Economics*, 17, pp.199-236

Lazear, E. and R.Moore (1984) “Incentives, productivity and labor contracts”, *Quarterly Journal of Economics*, 99, pp.275-96

Lazear, E. and S.Rosen (1981) “Rank-order tournaments as optimum labor contracts”, *Journal of Political Economy*, 89, pp.841-64

Leonard, J. (1990) “Executive pay and firm performance”, *Ind. Lab. Rel. Review*, 43, pp.13-29

Loewenstein, G. and N.Sicherman (1991) “Do workers prefer increasing wage profiles?”, *Journal of Labor Economics*, 9, pp.67-84

Main, B. (1992) “Top executive pay and company performance”

Main, B., C.O'Reilly and J.Wade (1993) "Top executive pay: Tournament or teamwork", *Journal of Labor Economics*, 11, pp.606-28

Malcomson, J. (1997) "Contracts, hold-up and labor markets", *Journal of Economic Literature*, 35, pp.1916-57

Malcomson, J. (1999) "Incentive contracts in labor markets" in *Handbook of Labor Economics*, Vol.3, O.Ashenfelter and D.Card (eds), North-Holland, Amsterdam

Manning, A. (1998) "Movin' on up: Interpreting the earnings experience profile", Centre for Economic Performance discussion paper 380

Marsden, D. and S.French (1998) "What a performance: Performance related pay in the public services", Centre for Economic Performance

McLeod, B. and J.Malcomson (1988) "Reputation and hierarchy in dynamic models of employment", *Journal of Political Economy*, 96, pp.832-54

Medoff, J. and K.Abraham (1981) "Are those paid more really more productive? The case of experience", *Journal of Human Resources*, pp.186-216

Meyer, M. (1992) "Biased contests and moral hazard: Implications for career profiles", *Annales d'economie et de statistique*, 25/26, pp.165-87

Meyer, M. (1991) "Learning from coarse information: Biased contests and career profiles", *Review of Economic Studies*, 58, pp.15-42

Murphy, K.J (1986) "Incentives, learning and compensation: A theoretical and empirical investigation of managerial labour contracts", *Rand Journal of Economics*, 17, pp.59-76

O'Reilly, C., B.Main, and G.Crystal (1988) "CEO compensation as tournament and social comparison: A tale of two theories", *Administrative Science Quarterly*, 33, pp.257-74

Osterman, P. (1994) "How common is workplace transformation and who adopts it?", *Ind. Lab. Rel. Review*, 47, pp.173-88

Osterman, P. (1995) “Skill, training and work organisation in American establishments”, *Industrial Relations*, 34, pp.125-46

Oyer, P. (1995) “The effect of sales incentives on business seasonality”, Princeton University

Paarsch, H. and B.Shearer (1997) “Fixed wages, piece rates and incentive effects: Statistical evidence from payroll records” Society of Labor Economists Conference Paper, May 2-3 1997

Pencavel, J. (1977) “Work effort, on-the-job screening and alternative methods of remuneration”, in *Research in Labor Economics*, Vol.1, R.G.Ehrenberg (ed), JAI Press, pp.225-258

Pendleton, A. (1997) “Characteristics of workplaces with financial participation: evidence from the Workplace Industrial Relations Survey.” *Industrial Relations Journal*, 28, pp.103-119

Prendergast, C. (1992) “Career development and specific human capital collection”, *Journal of the Japanese and International Economies*, 6, pp.207-27

Prendergast, C. (1999) “The provision of incentives in firms”, *Journal of Economic Literature*, 37, pp.7-63

Rosen ,S. (1988) “Promotions, elections and other contests”, *Journal of Institutional and Theoretical Economics*, 144, pp.73-90

Rosenbaum, J.E. (1979) “Tournament mobility: Career patterns in a corporation”, *Administrative Science Quarterly*, 24, pp.220-241

Schmidt, K.M. (1997) “Managerial incentives and product market competition”, *Review of Economic Studies*, 64, pp.191-214

Seiler, E. (1984) “Piece rate versus time rate: The effect of incentives on earnings”, *Review of Economics and Statistics*, 66, pp.363-76

Slade, M. (1996) "Multi-task agency and organisational form: An empirical exploration", *International Economic Review,* 37, pp.465-86

Spurr, S. and W.Barber (1994) "The effects of performance on a workers career: Evidence from minor league baseball", *Ind. Lab. Rel. Review,* 47, pp.692-709

Tirole, J. (1994) "The internal organisation of government", *Oxford Economic Papers*, 46, pp.1-29

Topel, R. (1991) "Specific human capital, mobility and wages: Wages increase with job seniority", *Journal of Political Economy*, 99, pp.145-76

Topel, R. and M.Ward (1992) "Job mobility and the careers of young men", *Quarterly Journal of Economics*, 107, pp.439-79

Van Audenrode, M. and J.Leonard (1998) "Compensation policies and firm productivity" LEED Conference Paper

Wilson, J. (1989) "Bureaucracy", Basic Books

Wilson, N. and M.J.Peel (1991) "The impact on absenteeism and quits of profit-sharing and other forms of employee participation", *Ind. Lab. Rel. Review,* 44, pp.454-68