Performance Related Pay Coverage in the UK

Marc Cowling

Principal Economist
Institute for Employment Studies
University of Sussex Campus
Brighton BN1 9RF

E-mail: marc.cowling@ies.ac.uk

Abstract

A simple model of the firms' decision to pay workers performance related pay (PRP) is tested using company level data for 1,001 UK private sector businesses. From the basic sample statistics we observe that, on average, 26.5% of workers are covered by PRP systems. Yet this hides the fact that only 50.5% of businesses have any workers at all covered by PRP. Our empirical analysis offers support for the key hypotheses drawn from Lazear type PRP models, which emphasise the relations between firm size and implementation costs, and ease of measurement, as medium and large firms are more likely to have PRP systems. However, these results are over-turned when we consider the extent of workers covered by firm level PRP systems if they are in place. Here we observe that more workers are covered by PRP in micro and small firms.

February 2007
ISBN: 978 1 85184 374 9
IES Working Paper: WP5

ies

1 Introduction

In this paper we use company level data from a UK survey of private business carried out in 2003 to analyse the determinants of performance related pay (PRP) coverage. We define PRP as any system which links a workers pay directly to her output. Hence we include standard piece rates, alongside alternative methods of linking pay and performance in line with, for example, Cowling (2000; 2001; 2002). The main contributions of this paper are twofold: firstly we use new data covering all sectors of the economy, and all size classes of firm; secondly, we are able to test for complementarities between PRP coverage, firm level objectives and strategies across four key areas, namely: innovation, human resources, governance, and customers & markets. This brings us in line with the work of Heywood et al. (1997) who used the Workplace Industrial Relations Survey (WIRS) to test for these types of effects on the incidence of PRP.

The issue of PRP itself is an interesting one, linked as it has been to increasing labour market flexibility (Booth and Frank, 1996; Brown, 1997) and productivity improvements (Wadwhani and Wall, 1990; Cowling and Harding, 2003). Others, notably Heywood et al. (1997) have contended that the implementation of PRP systems, at the firm level, in worker contracts has contributed to a decline in the level of unemployment. For these reasons, amongst others, national governments have been active in their support for PRP in recent years in both the public and private sectors of economies. This is set against the background of empirical evidence from Cowling (2001) that shows considerable disparities across the European Union in the proportions of private sector workers covered by PRP systems. For example, in Finland 34% of workers were covered by PRP in 1996. This compared to only 12% in the UK.

The literature on PRP raises several key issues. For example, the monitoring of workers is identified by Garen (1994), and Heywood et al. (1997), as crucial to the decision to introduce PRP. Booth and Frank (1996) and Lazear (1986;1996) all focus on the potential for PRP to attract high quality workers through its function as a sorting device. Effort levels are common to all theories. Brown (1997) outlined five key objectives of PRP systems, namely; attracting and retaining competent employees; to promote an achievement orientation; to reward good performance; to share the economic benefits of improved performance, and; to promote employee responsibility.

In terms of the theoretical underpinnings of PRP, Lazear (1986), later refined by Heywood et al. (1997), developed models that focused upon the costs associated with the design of appropriate measurement systems that would capture output or performance correctly. At the heart of such models is that the costs of designing and implementing a PRP system are fixed across firms. Thus the costs per worker are lower the larger the employment size of the firm. The relevant trade-off here is the costs of worker supervision to elicit required effort levels from time-rate workers. This type of model found strong empirical support from Cowling (2001) in a study of the EU-15.

2 The Model

From Lazear (1986) and Heywood (1997) we assume that there are fixed costs associated with setting up an appropriate PRP system. In larger firms these fixed costs are spread

across a larger number of workers, thus reducing the cost per worker. The total monitoring costs for a firm of size L can be written as aL for time –rate workers. The costs of a PRP system can be divided into fixed and variable, or per worker supervisory costs. Total PRP costs can be written as $F + gL$, where F is the fixed costs element and g is the per worker supervision costs. The rational firm only chooses a PRP system when per worker supervisory costs, given F, are lower under PRP. This requires that $a>g$. For smaller firms, supervision costs per worker are high, but in total they might be expected to be lower for time-rate systems in respect of the fixed costs, F, of designing and implementing a PRP system.

For the individual worker, utility is derived from income, whilst effort represents a disutility. This can be expressed as $U_i = Y_i – C(E_i)$, where Y is income for $E = Y$, and $C(.)$ is an increasing function where C' and C'' are both positive. Effort levels are assumed to be finite.

We assume that the objective of the firm is to maximise profit. This requires that workers compensation structure is such that they are willing to supply their labour time in the first instance. Given labour supply, the firm then selects the most appropriate compensation structure to maximise profits. Thus the firm maximises net surplus given increased effort but subtracting both the fixed and variable costs of designing and implementing a PRP system. For time-rate workers, monitoring ensures that workers supply a minimum effort level, although at the level of the individual she may choose to supply more effort ($E>E_{min}$). As with firms, we assume that workers aim to maximise their net surplus when choosing between time-rate and PRP systems. The workers decision is then to maximise $e – C(e)$. The decision to opt for time-rates then becomes, $E_m – a – C(E_m) > E^* - (F/L + g) – C(E^*)$. Here, the left hand side of the equation relates to time-rates and the right hand side to PRP. If $E_{min} = E^*$ then the decision between time-rates and PRP is solely based upon the unit monitoring costs. This implies that the greater the divergence between the two, the greater the probability that a PRP system will be implemented, as PRP induces higher effort levels all else equal.

H1: The larger the employment size of firm, the greater the coverage of PRP. This occurs as the costs associated with designing and implementing an appropriate PRP system are spread across more workers.

An additional, and relevant, issue is that of product / service quality. For example, Drago and Heywood (1995) and Ichniowski and Shaw (1995) argue that where quality is crucial to profitability, firms will avoid piece rates as they may be detrimental to quality and hence profits. Thus whilst piece rates may stimulate output, quality may be the price of greater output. This gives rise to a second testable hypothesis.

H2: Where product quality is crucial to firm performance, PRP coverage will be lower.

A further common strand in the literature is institutionalisation, which is related to embeddedness , or managerial intransigence. Eisenhardt (1988), for example, suggests that even in apparently similar firms, management culture can be quite different. For our

purposes an important aspect of this might be different views on how best to motivate and incentivise workers. A key point in her argument is that in some firms pay systems are so institutionalised that change is virtually impossible. Empirical support for this view is found in Ichniowski and Shaw (1995), who identify worker age and managerial tenure as negative factors in the adoption of new work practices. This gives rise to a third hypothesis:

H3: In firms where senior executives receive share options as part of their overall compensation, then coverage of PRP will be higher.

Thus far we have presented a model and drawn three testable hypotheses from the literature. Given the nature of our data we are able to empirically test these hypotheses alongside other issues of strategic complementarities, for example between other human resource practices and PRP coverage. Here we draw on previous contributions in the industrial relations and human resource management (HRM) fields. A common feature is that HRM practices are bundled (Cowling and Harding, 2003; Ichniowski et al., 1997), and further that complementary HRM practices can have large affects of performance (Macduffie, 1995). In line with, for example, Milgrom and Roberts (1995), Meyer et al. (1992), Macduffie and Krafcik (1992), we can test for strategic 'fit' across five key areas of management as, it is intuitively plausible that the gains from introducing PRP also raise the gains from introducing other, complementary HRM and strategic practices, particularly if complementarity is symmetric. From this we can present two further hypotheses:

H4: Higher PRP coverage will be positively associated with other, complementary, HRM practices and wider strategies consistent with output enhancement.

H5: Higher PRP coverage will be negatively associated with other strategies linked to quality enhancement.

Having framed five hypotheses, we now discuss the data to be used to empirically test them.

3 The Data

The data we use is drawn from a wider investigation into the competitiveness and performance of UK business. To this end, we draw upon data derived from a telephone survey of 1,000 UK businesses conducted in July 2003 by IFF Research on our behalf. The respondents to our survey were individuals at board level in their organisations or those who had a major input into the strategic decision-making process. This requirement was necessary to capture detailed evidence concerning corporate objectives and company level strategic positioning. One potential issue does arise from this in that high level strategic decisions may not permeate down to all levels of the company[1]. The survey requirements were that we had a sample representative of the size distribution of UK business, of

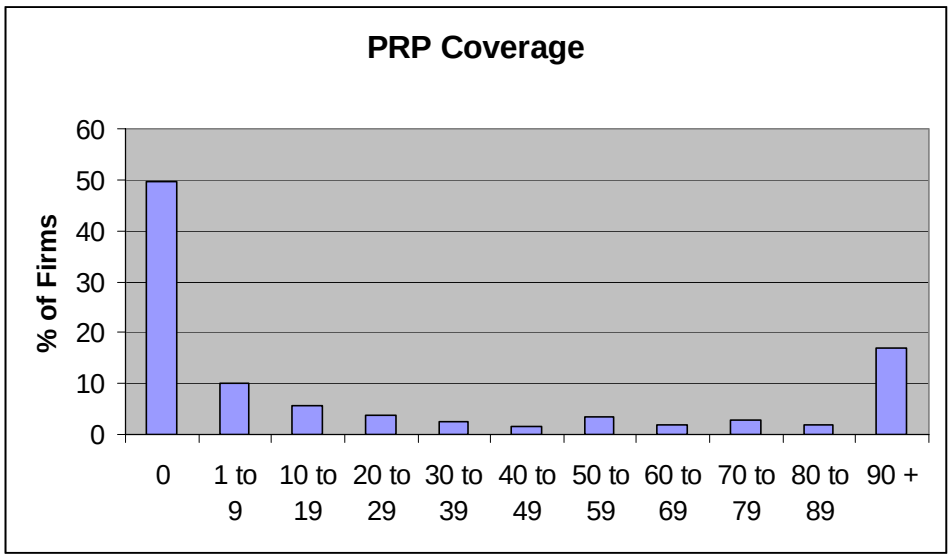
[1] We thank Professor Rick Delbridge, Cardiff Business School for raising this issue.

sectoral decomposition, and with adequate regional representation. One caveat is that we had to top up sampling of the largest size class of businesses to ensure adequate numbers for meaningful analysis.

4 Sample Statistics

Here we discuss the basic sample statistics, differentiating by various firm level characteristics. The headline figures are that 49.53% of firms have no workers at all covered by a PRP system. The average coverage is 26.51% of workers per firm. The median is 1% reflecting the left skewed distribution.

Fig 1: Distribution of Worker PRP Coverage by Firms



From Fig 1, we observe that the pattern is such that firms who have a PRP system at all tend to have either less than 10% of total workers covered, or more than 90%. This tends to imply two things. Firstly only certain kinds of workers are motivated by PRP and/or have an easily measurable output. This would explain the left peak for those that have any PRP system in operation. Secondly, once a PRP system is in place, it is more cost effective, and possibly less divisive, to expand coverage to the whole workforce. This might explain the relatively high concentration at the right hand side of the distribution.

Table 1 (see appendices) shows that there are significant sectoral differences in PRP coverage (ANOVA test, F=3.77, Sig=0.005). For example, in business services 34.38% of workers, on average, are covered by PRP. This compares to only 22.13% and 22.96% in Other Services and Construction respectively. Size of firm was also found to be a strongly significant determinant of PRP coverage (ANOVA test, F=10.48, Sig = 0.00001). Here micro businesses (<10 employees) had on average 20.07% of workers covered by PRP. This compares to 26.08% in small firms (10-49 employees), 35.17% in medium-sized firms (50-249 employees) and 38.94% in large firms (>249 employees). This is generally supportive of the fixed costs of designing and implementing PRP systems being lower if they are spread over more workers, although whether this holds in a multivariate framework will be tested for in our subsequent analysis.

We also note an age effect. Young firms (up to five years old) had, on average, 19.76% of workers covered by PRP. This compares to 27.93% in more established firms. This might suggest that it is easier to design an appropriate system of performance measurement when routines and procedures are established and fully operational. In addition, we observe an establishment effect with single plant firms having much lower proportions of workers on PRP, 20.51% than multi-plant firms, 36.02%, (ANOVA test, F = 38.82, Sig = 0.00001).

Turning our attention to proxies for product / service quality, we note that firms with a high quality focus are no more likely to have greater PRP coverage than firms not emphasising quality (26.2% compared to 28.7%, t-stat = 0.69, P>t = 0.49). However, firms with a strategic emphasis on developing innovative products / services are more likely to have greater proportions of workers covered by PRP. The respective averages for PRP covered workers are 30.55% and 22.93%. This latter result is evidence in favour of rejecting H2, and the former not fully consistent.

In the context of the institutionalisation, or embeddedness debate, we observe that firms in which senior executives receive share options have significantly higher PRP coverage amongst their workforces. The respective proportions are 31.43% for firms with executive share options and 25.18% for those without (t-stat=2.11, sig=0.03). This is consistent with H3 that hypothesises that firms with more forward thinking senior management teams will be less concerned about changing work practices.

Finally we turn to the issue of complementarities, or strategic 'fit'. On this, we note that there are no statistically significant differences in workers covered by PRP according to product / service diversity, growth orientation, employee commitment, union representation, or well functioning communication lines. However, a commitment to training and workforce development was associated with statistically higher PRP coverage. The respective proportions of workers covered are 21.77% for low training commitment firms and 27.71% for high training commitment firms (t-stat = 1.94, sig = 0.05). In addition, and consistent with the worker sorting argument, we observe that PRP coverage is significantly higher amongst firms able to attract high quality workers from industry competitors. The difference is large at 30.65% compared to 21.25% (t-stat = 3.81, sig = 0.0001).

To summarise, PRP coverage, from our univariate results, is highest in business service firms, in larger, multi-plant, public firms, in firms with a positive approach to new working practices, in older firms, and in firms where product / service innovation is important. In addition, firms with a commitment to training and those who are able to attract high quality employees all are more likely to have higher PRP coverage.

5 Estimation

Given the potential for selection effects to be present from both the firm and worker in the design and implementation of PRP systems and coverage, we choose to adopt a Heckman selection model (Heckman, 1976) which assumes an underlying regression relationship of the form:

$$(1) \quad y_j = \mathbf{x}_j\beta + u_{1j} \qquad \text{[regression equation]}$$

The dependent variable, in this case worker PRP coverage, is not observed if the firm has no PRP system at all. Thus the dependent variable, worker PRP coverage, for observation j is observed if:

$$(2) \quad \mathbf{z}_{j\gamma} + u_{2j} > 0 \quad \text{[selection equation]}$$

where:

$$u_1 \sim N(0, \sigma)$$

$$u_2 \sim N(0, 1)$$

$$\text{corr}(u_1, u_2) = \rho$$

When $\rho \neq 0$, normal regression procedures can yield biased results. To correct for these potential distortions we adopt the Heckman two-step estimator that generates consistent, and efficient, estimates for our model parameters. These former effects may not be an issue for us if firms decide randomly to adopt a PRP system. This is unlikely given the theoretical and empirical evidence presented in our literature review and model building. The actual models can be written thus:

Step 1: Firm has PRP System = *f* (firm demographics + strategic orientation + HRM systems + geographical region)

Step 2: Workers Covered by PRP = *f* (firm demographics + strategic orientation + HRM systems)

Using this two-step procedure, we then estimate the determinants of PRP coverage using our 2003 UK firm level data.

6 Results

The first point of note is that the selection term is significant. The interpretation is that firms that design and implement a PRP system do so because they are more likely to have a high coverage of workers on that system. This is consistent with spreading the fixed costs of the system over larger proportions of workers. Thus the decision to adopt PRP is not random. From the selection equation, we note that firms located in Wales are significantly less likely to have PRP systems. This might suggest that there are cultural, and/or institutional differences that mitigate against their adoption in this region. Only two other effects were identified, a firm size effect and a sectoral effect. On the former, we note that medium-sized firms are most likely to have a PRP system. Large firms were also more likely to have a PRP system than small firms and micro businesses. These results are consistent with the, per worker, fixed cost of design and implementation hypothesis, H1. On the latter, we note that firms in Other Services are more likely to have a PRP system than firms in any other sector of the economy. Further, we find little support for hypotheses H2-H5 that relate to quality, management practices, complementary HRM practices, and quality orientated strategies.

From the PRP coverage equation, having taken account of selection effects, we only observe three significant effects. Firstly, we again observe that Other Services firms are significantly more likely to have high worker coverage of PRP than those in all other

sectors. We also observe firm size effects, but in the opposite way to those identified in the selection equation. Here we find that coverage of workers by PRP is lowest in medium-sized firms, even though they are most likely to have a PRP system in place. The same can be said about large firms, although the impact is smaller, albeit still strongly significant. Age of firm was also identified as having an impact on PRP coverage, although the pattern is a little hard to interpret. On this we note that five year old firms, three year old firms, and very old firms (>23 years old), in descending order of magnitude, had significantly higher PRP coverage. Once again, we find little support for our other, non-size related, hypotheses.

Table 3: Summary of Hypotheses and Empirical Findings

Hypothesis	Expected Sign	PRP System Results	PRP Coverage Results
Firm size	+ve	+ve	-ve
Product / Service Quality Emphasis	-ve	0	0
Senior Management Share Options	+ve	0	0
HRM Strategies	+ve	0	0
Quality Focus Strategies	-ve	0	0

7 Conclusion

We have presented new empirical evidence relating to those factors that influence the decision to implement a PRP system, and subsequent worker coverage of PRP, using data from a large UK survey. The results were then tested against five hypotheses drawn from the literature. We find support for the firm size hypothesis to the extent that medium and large firms are significantly more likely to have a PRP system in place than smaller sized firms. But if smaller sized firms do have a PRP system in place, worker coverage is higher. By contrast, we find little evidence to support our other hypotheses which relate to product / service quality, progressive management systems, and HRM systems.

Crucially, we find that the decision to adopt a PRP system is not random implying that firms that do implement a PRP system are doing so with the intention of having high worker coverage. This is consistent with reducing the per worker costs of designing and implementing a PRP system in the first place. Finally, we observe that just over half of all UK firms have some form of PRP system in place, although on average only 26.5% of UK workers are covered by PRP. This is significantly higher than the figure for 1996 reported in Cowling (2001) for the UK, which was 12.0%. One final point is that the univariate statistics are generally more supportive of our hypotheses than the multivariate results. This suggests that omitted variable bias may be an important issue for empirical studies in this area.

Appendix

Table A1: Univariate Statistics

Variable	PRP Coverage %	Significance
Size		
Micro	20.07	
Small	26.08	
Medium	35.17	
Large	38.94	0.00
Sector		
Primary / manufacturing	24.75	
Construction	24.62	
Retail	22.96	
Business Services	34.38	
Other Services	22.13	0.01
Legal Status		
Public Ltd	41.60	
Private Ltd	27.11	
Partnership	19.25	
Sole Trader	20.91	
Other	24.94	0.00
Number of Plants		
Single Plant Firm	20.51	
Multi-plant Firm	36.02	0.00
Senior Management Share Options		
Yes	31.43	
No	25.18	0.03
Product / Service Quality Focus		
Yes	26.2	
No	28.7	0.49
Innovation Led		
Yes	30.55	
No	22.93	0.00
Product / Service Diversity		
Yes	27.59	
No	24.51	0.28
Growth Orientation		
Yes	28.37	
No	25.09	0.19

Training Focus		
Yes	27.71	
No	21.77	0.05
High Employee Commitment		
Yes	26.56	
No	26.02	0.90
Trade Union Recognition		
Yes	25.96	
No	26.92	0.70
Internal Communication Lines Function Well		
Yes	27.03	
No	21.75	0.20
Attracts High Quality Workers from Competitors		
Yes	30.65	
No	21.25	0.00

Notes: ANOVA oneway test and t-tests reported where appropriate.

Table0 A2: Heckman Selection Equation

Variable	Coefficient	Z-stat
Sector		
Construction	-0.24	0.92
Retail	-0.10	0.53
Business Services	-0.14	0.73
Other Services	-0.73	2.72
Base = primary / manufacturing		
Firm Size		
Small	0.27	1.17
Medium	0.82	3.63
Large	0.58	2.66
Base = micro		
Legal Status		
Private Ltd	0.08	0.41
Partnership	0.11	0.64
Sole Trader	0.01	0.01
Base = public ltd		
Management Share Options	0.20	1.04
Quality Focus	0.16	0.76
Innovation Led	0.16	0.96
Product / service diversity	0.04	0.26
Growth Orientation	-0.10	0.52

Training Focus	-0.22	0.95
High Employee Commitment	-0.11	0.43
Trade Union Recognition	0.12	0.80
Internal Communication Lines Function Well	0.36	1.40
Attracts High Quality Workers from Competitors	0.04	0.25
Region		
East	0.05	0.17
London	0.15	0.65
North East	-0.05	0.24
North West	-0.14	0.70
South East	0.01	0.09
South West	0.35	0.86
West Midlands	-0.31	1.43
Yorkshire & Humberside	-0.02	0.15
Wales	-0.37	1.77
Base = East Midlands		
Constant	-0.57	0.79
Selection term	-45.89	18.50
LR test of independent equations ($\rho = 0$)	$\chi2$ (1) = 77.58 Prob>$\chi2$ = 0.0000	

Table A3: Heckman Performance Related Pay Coverage

Variable	Coefficient	Z-stat
Sector		
Construction	16.07	1.55
Retail	2.09	0.27
Business Services	12.15	1.52
Other Services	30.35	2.74
Base = primary / manufacturing		
Firm Size		
Small	-10.49	1.14
Medium	-39.94	4.31
Large	-27.78	2.86
Base = micro		
Legal Status		
Private Ltd	-5.38	0.65
Partnership	1.43	0.21
Sole Trader	-40.68	1.49
Base = public ltd		
Single Plant	-49.67	1.05

Management Share Options	-0.23	0.03
Quality Focus	-7.47	0.81
Innovation Led	4.37	0.70
Product / service diversity	0.52	0.08
Growth Orientation	-11.09	1.63
Training Focus	9.32	0.95
High Employee Commitment	3.14	0.33
Trade Union Recognition	-0.08	0.01
Internal Communication Lines Function Well	-3.72	0.36
Attracts High Quality Workers from Competitors	2.70	0.40
Constant	48.67	1.67
N obs	367	
Censored obs	127	
Uncensored obs	240	
Log likelihood	-1351.257	
Prob > chi sq	0.0000	

References

Booth, A, Frank, J (1996) Performance Related Pay. *ESRC Research Centre on Micro Social Change Working Paper* No. 96-14. University of Essex. England.

Brown, C (1990) Firms' Choice of Method of Pay. *Industrial Labour Relations Review*, 43 (3). 165s – 182s.

Cowling, M (2000) Performance Related Pay in Belgium and the Netherlands. *Applied Economics Letters,* 7(10), October. 653-657.

Cowling,M (2001) Fixed Wages or Productivity Pay: Evidence from 15 EU Countries. *Small Business Economics***,** Vol.16 (3). 191-204.

Cowling, M (2002) The Extent and Determination of PRP Systems in Scandinavian Countries. *Applied Economics,* 34. 305-316.

Cowling, M, Harding, R (2003) The Effect of Intangibles on Productivity. *The Work Foundation*. London.

Drago,R, Heywood,J.S (1995) The Choice of Payment Schemes: Australian Establishment Data. *Industrial Relations*, Vol.34 (4). 507-531.

Eisenhardt,K.M (1988) Agency-And Institutional Theory Explanations: The Case of Retail Sales Compensation. *Academy of Management Journal*, Vol.31 (3). 488-511.

Garen, J (1994) Executive Compensation and Principal-Agent Theory. *Journal of Political Economy*, 103. 1175-1199.

Heckman, J (1976) The Common Structure of Statistical Models of Truncation, sample selection, and limited dependent variables and a simple estimator for such models. *The Annals of Economic and Social Measurement*, 5. 475 – 492.

Heywood,J.S, Siebert,W.S, Xiandong,W (1997) Payment by Results Systems: British Evidence. *British Journal of Industrial Relations*, 35:1, March. 1-22.

Ichniowski, C, Shaw, K (1995) Old Dogs and New Tricks: Determinants of the Adoption of Productivity-Enhancing Work Practices. *Brookings Papers: Microeconomics*. 1-65.

Ichniowski, C, Shaw, K, Prennushi, G (1997) The Effects of HRM Practices on Productivity: A Study of Steel Finishing Lines. *American Economic Review,* 87. June. 291-313.

Lazear, E (1986) Salaries and Piece Rates. *Journal of Business*, 59(3). 405-431.

Lazear, E (1996) Performance Pay and Productivity. *NBER Working Paper* No.5672.

Macduffie, J (1995) Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry. *Industrial and Labor Relations Review*, 48 (2). January. 197-221.

Macduffie, J, Krafcik, J (1992) Integrating Technology and Human Resources for High Quality Manufacturing. In T.Kochan and M.Useem (eds) *Transforming Organizations*. Oxford University Press.

Meyer, M, Milgrom, P, Roberts, J (1992) Organizational Prospects, Influence Costs, and Ownership Changes. *Journal of Economics & Management Strategy*, 1 (1). 9-36.

Milgrom, P, Roberts, J (1995) Complementarities and Fit: strategy, structure and organizational change in manufacturing. *Journal of Accounting & Economics*, 19. 179-208.

Wadwhani, S, Wall, M (1990) The Effects of Profit Sharing on Employment, Wages, Stock Returns and Productivity. *Economic Journal*, 100. March. 1-17.