Labour Productivity in Australian Workplaces: Evidence from the AWIRS*

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Abstract

This paper provides some empirical evidence on the determinants of labour productivity in the workplace using data from the Australian Workplace Industrial Relations Survey (AWIRS). The results presented in this paper support the general conclusions reached by other authors investigating productivity, that is, workplace practices—particularly the organisation of work—matter for labour productivity. This suggests that there are a number of issues at the workplace that management can directly address in order to improve labour productivity and workplace efficiency.

Key words: labour productivity, firm performance.

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1. Introduction

Policymakers' interest in productivity is perhaps best summarised by the Industry Commission in one of the opening statements in a report on Australia's productivity performance "productivity growth is the key ingredient in promoting sustainable economic growth and improving the material living standards of Australians" (Industry Commission, 1997, p. iii). The analysis and measurement of labour productivity levels and growth at the workplace has important implications in understanding the determinants of aggregate productivity, as productivity gains at the workplace level are translated into aggregate improvements.

Analysis of the factors affecting workplace productivity has taken on new meaning as Australian firms attempt to 'survive and thrive' in an increasingly competitive global environment. Against this backdrop, managers are concerned with the level and growth of labour productivity, since 'producing more with less' can directly affect profitability as well as the long-term survival of the firm. Unions are interested in ensuring that employees are able to benefit from any perceived gains in productivity at the workplace level, and therefore have a keen interest in being able to accurately to assess the overall performance of the firm.

There is, however, a lack of empirical analysis at the workplace level on Australian data despite the existence of surveys such as the ABS's *Growth and Performance Survey* and the (then) Department of Workplace Relations and Small Business's *Australian Workplace Industrial Relations Survey* (AWIRS) (Dawkins and Rogers, 1998). This paper fills part of this gap by providing some empirical evidence on the determinants of labour productivity in the workplace using data from the AWIRS and utilising an ordered probit technique. Although labour productivity is only a partial measure of productivity, it nevertheless provides a useful starting point. Such a measure is widely used in the literature, and comparisons with other studies can therefore be made. It also avoids some of the complications associated with calculating capital and total factor productivity (see, for example, Hall, 1986, and Morrison, 1993).
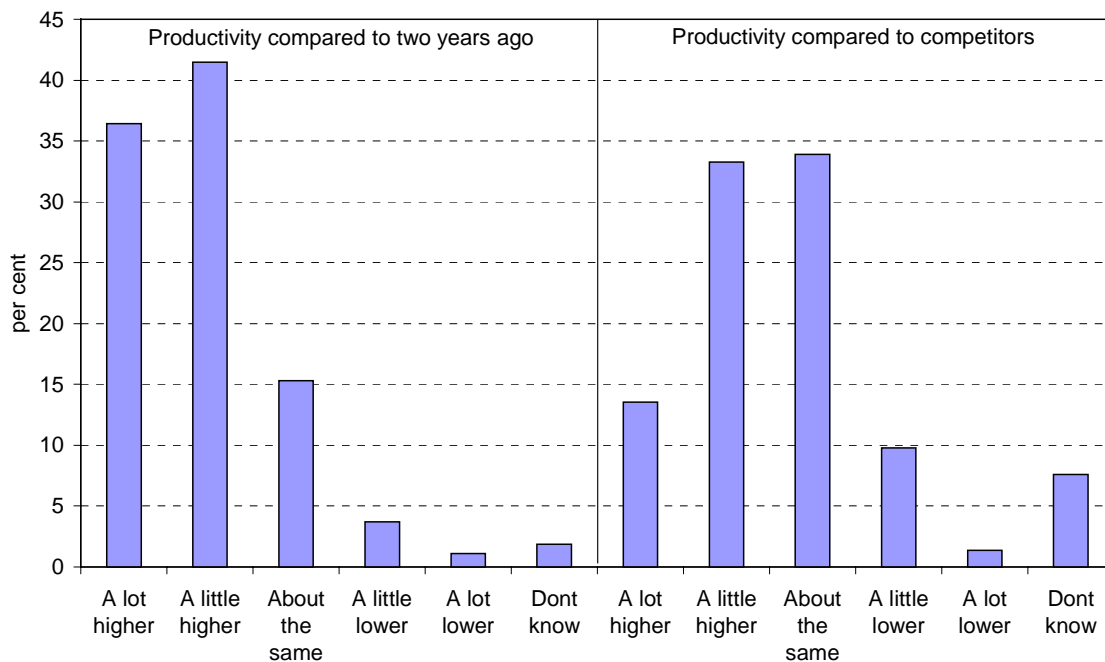
Section 2 provides a description of the survey and some general firm characteristics, and Section 3 outlines the model. The results are given in Section 4, which also compares these estimates to those found elsewhere in the literature. Section 5 concludes.

2. Firm characteristics: 1995 survey

The data are taken from the 1995 AWIRS, which is in turn based on a random sample of workplaces—stratified by industry and size—selected from the ABS Business Register. The survey utilised here was conducted at workplaces with 20 or more employees (excluding agriculture, forestry, fishing and defence), and has 2001 observations.

The majority of workplaces appear to have some form of official indication of how they are performing. In the 1995 survey, 73 per cent of workplaces indicated that they had procedures in place that regularly measured labour productivity. The same percentage of workplaces reported using key performance indicators (such as customer satisfaction or set-up time) and 70 per cent indicated that they benchmarked against other workplaces.

Figure 1. Productivity comparison

Two qualitative measures of labour productivity are used in this analysis. Specifically, managers are asked the following questions: "How would you generally describe labour productivity at this workplace compared with 2 years ago?"; and "In your opinion, how does the level of labour productivity **here** compare with your major competitors?" The following responses are available: "A lot higher, a little higher, about the same, a little lower, a lot lower".

Figure 1 indicates that the majority of responses are skewed towards the upper end of the scale; quite heavily in terms of productivity growth, but less so with productivity levels.

Given these characteristics, the validity of using such a variable as a measure of labour productivity at the workplace has been called into question (Rimmer and Watts, 1994). The term "in your opinion" is of particular concern, and it has been suggested that the response of managers may be biased by the manner in which they interpret productivity (Drago and Wooden, 1992; Hawke and Drago, 1998).

However, there are several reasons why this subjective measure contains useful information. First, it avoids some of the difficulties associated with accurately measuring labour productivity using output and input variables, and provides a useful counterpoint to analyses that utilise quantitative rather than qualitative data (Blanchflower and Machin, 1996; Machin and Stewart, 1990, 1996). Machin and Stewart (1996) also conduct several tests on a similar variable from the British Workplace Industrial Relations Survey. These tests find that there is no systematic reporting difference across observable characteristics of the workplace, and workplaces reporting a 'below average' performance (compared to their competitors) were significantly more likely to have closed down during the period under review. Assuming that Australian managers are no more likely to be biased than their British counterparts, then it can be inferred from these results that subjective, categorical variables *can* be utilised for the purposes of estimating the determinants of labour productivity in Australia.

As a precursor to the multivariate analysis, productivity responses (both levels and growth) were cross-tabulated with a wide range of workplace characteristics, the results of which are given in Appendix Table 1 (growth) and Appendix Table 2 (levels). The AWIRS contains hundreds of questions relating to workplace characteristics and industrial relations. However, based on the review of the literature, the variables were narrowed to the range given in the appendix as it was deemed that these were likely to capture the majority of the explanatory power. The full range of variables presented in these two tables are not included in the estimation for the simple reason that the analysis would then run the risk of being a parsimonious model.

2.1.   Productivity growth

The communication and utilities industries were far more likely than other industries to report high productivity growth, whereas the construction, manufacturing and transport and storage industries appeared more likely to have had little or no growth over the previous two years. Workplaces that had a higher percentage of responses in the 'a lot higher' category:

- were one workplace organisations;
- were operating a lot above capacity utilisation;
- had more than 60 per cent of employees as clerks and salespersons, and more than 75 per cent of employees as part time;
- had more than 1000 employees;
- had all employees owning shares in the company;
- had more than five schemes in operation;
- had very good employee/management relations;
- had a management plan for corporate goals;
- benchmarked against other workplaces;
- were not discouraged by management from joining a union;
- experienced organisational change over the past two years; and
- had formal training for non-managerial employees.

Workplaces that were part of a larger organisation, had no specific set goals, or had undertaken no organisational change over the past two years, had a significantly higher number of respondents in the 'about the same' category.

2.2.   Productivity levels

In terms of productivity level responses, a larger proportion of workplaces located in the recreational services industry reported that productivity was 'a lot higher' than their competitors. However, nearly one third of respondents in the communications industry reported that productivity was 'a little lower' than their competitors (compared to an average of 10 per cent for the full sample).

There appeared to be fewer obvious features that determined whether workplaces reported productivity as being 'a lot higher' than their competitors, compared to those for productivity growth. Workplaces that did report higher productivity levels:

- were working at above full capacity;

- had more than 75 per cent of the workforce working part time;
- had 10 to 25 per cent of employees receiving performance based pay, 1 to 9 per cent and 26 to 50 per cent owning shares in the company; and
- had very good employee/management relations.

The above characteristics do not represent the full range of explanators utilised in the following analysis, nor are all these variables necessarily used themselves. The variable that measures whether management discourages employees from joining a union was omitted, as it was deemed that the discrete measure 'union density' was a more appropriate method of measuring union influence on labour productivity at the workplace. The variables that measure how much influence employees have over certain workplace practices *were* included to determine whether employee involvement could influence productivity outcomes. Others were simply included as control variables, such as the industry dummies, capacity utilisation and the size of the workplace (estimated by the number of employees).

3. Model

Typically, the production process of the workplace is described using the concept of a production function that links output to a range of inputs. The most common example is the Cobb-Douglas production function, given by $Y = K^{\alpha}(AL)^{1-\alpha}$, where Y is output, K is capital, L is labour and A is 'knowledge' or 'the effectiveness of labour'. Rearranging this equation to yield $Y/L = A^{1-\alpha}(K/L)^{\alpha}$, it can be seen that variation in labour productivity within the workplace can arise from the elasticity of substitution between labour and capital (α), the capital to labour ratio and the 'knowledge/ effectiveness of labour' variable (Rogers, 1998). It is this 'effectiveness of labour' variable which is supposed to capture the diverse ways in which the production process is organised, including the interaction of management and employees, and the accumulation of human capital by employees. While it is a relatively straightforward process to include additional variables in models of labour productivity, there is little guidance from theory as to *what* variables should be included, except to say that the (A) term captures them all.[1]

The model estimated in this paper is of the form, $y = \Sigma \beta_i x_i + \varepsilon$, where *y* is an unobservable index of labour productivity, x_i are the independent variables and ε is an error term. Labour

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[1] See Green, 1992, for an exposition on the difficulties in using the neoclassical production function.

productivity is related to factors that influence technical change and efficiency, while controlling for capital inputs through the use of industry dummies.[2] As the responses for both productivity levels and productivity growth are (ordered) categorical (*i.e.* the choices range from 0 to 4), the estimation method used here is an ordered probit. For identification purposes, all boundary parameters can be estimated without a constant, or, if a constant is included, the first boundary parameter must be restricted to zero (this model is estimated without a constant). Additionally, the error term is specified as having a mean of zero and a variance of one.

The model assumes that observed productivity, *y*, is related to an underlying latent variable— that of the *actual* productivity level or growth, *y**, associated with a particular workplace. Productivity is determined not only by *y**, but also by its relationship to the boundary parameters, μ_i, which jointly determine the observed outcome. That is, given the five alternatives outlined above, the following is observed:

$$y = \begin{cases} 0 & \text{if } y^* \leq 0, \\ 1 & \text{if } 0 < y^* \leq \mu_1, \\ 2 & \text{if } \mu_1 < y^* \leq \mu_2, \\ 3 & \text{if } \mu_2 < y^* \leq \mu_3, \\ 4 & \text{if } \mu_3 \leq y^*. \end{cases}$$

where y* is a function of certain characteristics and practices specific to the workplace, $\underline{x}_i$, which have unknown weights $\underline{\beta}$. Assuming a linear relationship and a random sample of *N* workplaces *i* = 1,…,*N*, then the following is obtained:

$$y_i^* = \underline{x}_i' \underline{\beta} + u_i$$

If the u_i of the above equation are independently standard normally distributed, the probability that workplace *i* "chooses" alternative *j* (j = 0,…J-1)[3] will be:

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[2] Adequate measures of the capital stock for individual workplaces were not available from the AWIRS.

[3] J is the total number of alternatives, here J = 5.

$$\Pr(s_i = 0) = \mathrm{F}\,(-\underline{x}_i^{'}\underline{\beta}),$$

$$\Pr(s_i = 1) = \mathrm{F}\,(\mu_1 - \underline{x}_i^{'}\underline{\beta}) - \mathrm{F}\,(-\underline{x}_i^{'}\underline{\beta}),$$

$$\Pr(s_i = 2) = \mathrm{F}\,(\mu_2 - \underline{x}_i^{'}\underline{\beta}) - \mathrm{F}\,(\mu_1 - \underline{x}_i^{'}\underline{\beta}),$$

$$\Pr(s_i = 3) = \mathrm{F}\,(\mu_3 - \underline{x}_i^{'}\underline{\beta}) - \mathrm{F}\,(\mu_2 - \underline{x}_i^{'}\underline{\beta}),\ \text{and}$$

$$\Pr(s_i = 4) = 1 - \mathrm{F}\,(\mu_3 - \underline{x}_i^{'}\underline{\beta})$$

with the requirement that $0 < \mu_1 < \ldots < \mu_{J-2}$, and where Φ is the standard normal cumulative distribution.

A full explanation of the variables used is contained in Table 1, with most entered as zero-one indicator (dummy) variables. Variables that are ordered qualitative in nature are also entered as dummies to avoid forcing quantitative effects onto a qualitative variable.[4]

Table 1: Estimated variables

Variable	Description	Mean	Std. Deviation
Dependent			
plvl	Productivity level (compared to similar workplaces)		
pgth	Productivity growth (compared to two years ago)		
Industrial relations			
uden	Union density (union members share of total employees)	48	37
scheme	More than 5 of any of the following schemes in place (1 = Yes): Formal training scheme, Incentive bonus scheme, Semi-autonomous work group, Skills audit, Staff evaluation scheme, Quality circles, Team building, Total quality management, Computer integrated management, "Just in time"	34	47
emprel	Employee/management relations (1 = Very good)	36	48
unions	Number of unions	2	2
auto1	Employee influence over work allocation (1 = A lot)	20	40
auto2	Employee influence over job performance (1 = A lot)	42	49
auto3	Employee influence over work pace (1 = A lot)	39	49
auto4	Employee influence over workplace management (1 = A lot)	12	33
auto5	Employee influence over work times (1 = A lot)	15	36
awards	Number of awards	3	5
agree	Any written agreements (1 = Yes)	49	50
cont	Any employees on individual contracts (1 = Yes)	29	45
action	Industrial action in the past year (1 = Yes)	28	45
orgch	Major organisational change over past 2 yrs (1 = Yes)	84	36
train	Formal training for employees in last year (1 = Yes)	75	43
Goals	Management plan for corporate goals (1 = Yes)	87	34
overaw	Any employees receive over award pay (1 = Yes)	47	50
Workplace characteristics			
onewp	One workplace organisation (1=Yes)	84	37
emp	Number of employees	187	344

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[4] The main drawback of this is that sources of variation in the data are potentially being lost.

Variable	Description	Mean	Std. Deviation
lbrcst	Labour cost is greater than 80 per cent of total costs (1 = Yes)	14	35
caputi	A lot above capacity utilisation (1 = Yes)	24	43
compet	Degree of competition (1 = strong/intense competition)	80	40
pt	Per cent of employees that are part-time/casual	25	29
manpro	Per cent of employees that are managers & professionals	18	22
pprtpe	Per cent of employees that are part-time/casual	19	25
clesal	Per cent of employees that are part-time/casual	30	30
maclab	Per cent of employees that are part-time/casual	24	30
Economic incentives			
perpay	No employees received performance based pay	68	--
	1 to 9% received performance based pay	9	--
	10 to 25% received performance based pay	6	--
	26 to 50% received performance based pay	3	--
	51 to 75% received performance based pay	2	--
	76 to 99% received performance based pay	5	--
	All employees received performance based pay	6	--
share	No employees own shares	86	--
	1 to 9% own shares	3	--
	10 to 25% own shares	3	--
	26 to 50% own shares	3	--
	51 to 75% own shares	2	--
	76 to 99% own shares	2	--
	All employees own shares	1	--
Industry			
mine	Mining	4	19
manu	Manufacturing	19	39
egw	Electricity, gas, water	4	19
public	Government administration, defence, education, health	22	42
cons	Construction	4	21
trad	Wholesale, retail trade	13	33
tran	Transport, storage	5	21
comm	Communication	3	18
finc	Finance, business, insurance, property	11	31
recr	Recreational services	15	35

4. Results

Model 1 gives the results for productivity levels, and model 2 gives the estimates for productivity growth. Care should be taken when interpreting coefficients on ordered probit estimates. There are several reasons for this. Firstly, the impact of a change in an explanatory variable on the estimated probabilities of the intermediate classifications (a little higher, about the same, a little lower) cannot be determined *a priori*, but relies on the shape of the density function as well as the magnitude of the specific coefficient.[5] Secondly, the absolute

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[5] Note however that the impact of a change in the explanatory variable on the extreme ends of the classification *can* be determined *a priori*.

magnitude of the coefficients cannot be given any meaning, because of the identifying restriction that the variance on ε equals one (Becker and Kennedy, 1992). Although not necessarily just related to ordered probit estimates, the following points should also be taken into consideration. It is sometimes unclear which way the direction of causation is running. For example, good employee-management relations may be associated with higher labour productivity at the workplace simply because firms with high productivity may be able to more easily afford to implement these (typically resource intensive) measures. Consequently these estimates may be better thought of as 'associations' rather than 'causation'. The productivity growth measure does not differentiate between those firms who start out with low productivity (they are simply "catching up") and those who are already "high achievers" and are managing to maintain this effort.

The first observation is that there are more statistically significant variables influencing productivity *growth* as compared to productivity *levels*.[6] The result for the industrial relations variables are examined first followed by economic performance and workplace characteristics.

4.1. *Industrial relations*

Of particular interest to a number of applied researchers is the influence that unions have on workplace productivity. Freeman and Medoff (1984) suggest that unions have the ability positively to influence labour productivity by giving employees a 'voice' at the workplace (thereby reducing the number of voluntary quits) as well as 'shocking' management into adopting practices that are productivity enhancing. On the other hand, the 'monopoly face' of unionism—where the workplace is characterised by restrictive workplace practices and adversarial style industrial relations—implies that the presence of trade unions will have a negative impact on labour productivity. Despite the burgeoning empirical literature on this topic, considerable debate surrounds the results in support of either hypothesis. Although unionised firms in the US are typically associated with higher productivity levels (Turnbull, 1991), evidence from the UK and Australia appear to suggest the opposite (Crockett *et al*, 1992, Metcalf, 1990). The results for the number of unions (unions) in model 1 seem to support neither claim, as the coefficient is of the correct sign but not significant at any

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[6] A possible explanation for this result is that the industry dummies do not effectively control for relative capital intensity in the workplace, and therefore the comparison across workplaces yields few meaningful estimates. This matter will be explored in future research.

meaningful level of significance. The number of unions at the workplace also appears to not have any impact on productivity growth. This is in line with the Australian estimates provided by Blanchflower and Machin (1996), who could discern no union/productivity association.

This result does not hold when looking at the results for the union density variable. Although there is still no obvious impact on productivity levels, it does appear that productivity growth is positively related to union density. A possible explanation is that the higher share of union membership as a proportion of total employees may make it easier for workplaces to disseminate information about the productivity enhancing workplace changes that are to be implemented. Additionally, negotiating with unions about implementing these changes may be easier than trying to convince employees by themselves. There is also a possibility that this variable represents a form of 'union voice' measure. If a larger share of unionised employees in turn reduces the number of quits, or encourages management to adopt labour saving technology, then this may have exerted a positive influence on productivity growth over the past two years.

Organisational change (including measures to improve workplace productivity and become more competitive) had a positive impact on productivity growth, but no significant association with productivity levels. It should be expected that organisational change designed to increase productivity would have the desired effect. However, some caution needs to be exercised in attaching too much significance to these results, as a manager may feel reticent about suggesting that major upheaval at the workplace has had little or no impact. Related to organisational change is the adoption of various practices, such as semi-autonomous workgroups or quality circles, designed to improve workplace performance. Ten options were given in the questionnaire (see Table 1), and the variable *schemes* was calculated as an indicator variable of one if a workplace had at least half of these practices in place, and zero otherwise. Although the presence of these schemes had no discernible impact on productivity levels, there was a positive and significant relationship with productivity growth.

Employee skill levels are also expected to have a positive impact on productivity, since skilled employees may more easily be able to implement and adapt to productivity enhancing changes. An investigation into why West German firms were more productive than their British counterparts, found that differences in relative employee skills (as well as

management practices) were crucial factors in explaining productivity differences (Daly *et al*, 1985). For Australia, Crockett *et al* (1992) found that a higher percentage of professionals led to higher productivity levels. Black and Lynch (1997) also find a positive association between skills and productivity in US workplaces, using the share of non-managerial workers who use computers as a proxy for employee skills.

Although the AWIRS does not provide an explicit variable that measures employee skill, several proxies can be used, including the amount of formal training an employee receives and the share of managers, administrators, professionals and para-professionals employed at the workplace. Training is expected to have a positive impact on labour productivity, since investing in new capital equipment is unlikely to raise productivity if the workforce is unable to properly utilise it. The results from including these variables in the estimation find no significant influence on productivity levels from training (contrary to that found by Drago and Wooden, 1992), although it is approaching significance at the 10 per cent level. Including occupation groups appeared to do little to improve the situation. Indeed, having machine operators and labourers at the workplace (supposedly a low skilled group) had a significant *positive* influence on productivity as compared to the omitted category (para-professionals and tradespersons). When productivity *growth* is examined however, formal training for employees is found to increase the probability that a workplace will have higher productivity now compared to two years ago. Low skilled employees are still exerting the greatest influence on productivity growth.

It is generally recognised that at the firm level, the existence of a 'harmonious work environment' is an essential part of fully utilising the productive potential of invested capital (National Australia Bank, 1987, p 4). The results presented here support this hypothesis, with both models indicating that good management/employee relations have a positive impact on the probability of having higher productivity than competitors, and compared to two years ago (a result also found by Drago and Wooden, 1992).[7] Related to this is the ability of management to set clear goals, and the willingness of employees to achieve them. As is relatively well documented in the management literature (see for example McConkey, 1983),

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[7] The employee/management relations response from the *Employee Relations Management Questionnaire* is used, rather than that available from the *General Management Questionnaire*. This is in an attempt to avoid any possible bias that may arise from having the general manager answering both the productivity and employee/ management relations questions.

setting clear goals for employees assists in improving firm performance. Such goals may include strategic plans (which establish the firms overall objectives and position in relation to their environment) and operational plans (which specify *how* the overall objectives are to be achieved). The results for the 'goals' variable supports this view, with the second model indicating that the setting of goals by management increases the probability of having high productivity growth.

Perhaps somewhat surprisingly, whether or not a workplace had experienced any industrial action over the past year had no significant influence over the probability of having higher productivity levels or growth. Although the coefficients were of the expected (negative) sign, neither of the models was significant at any meaningful level of significance. A possible explanation is that the 'yes/no' response may not be an adequate measure of the impact of industrial action on workplace productivity.

The active involvement of employees in determining how production at the workplace is undertaken may possibly influence workplace performance. *A priori* it is uncertain as to which direction such involvement will effect productivity. If employee control leads to shirking, then the impact is likely to be negative. On the other hand, if employees know best how to undertake certain tasks, then there could possibly be a positive association. Work allocation, job performance, work pace, workplace management and work times were fives areas in which employees were identified as possibly having some sort of control. However, when all five variables (auto1 through to auto5) were included in the estimation it was found that the primary factor that increased the chances of being at the lower end of the productivity *growth* scale was where employees had 'a lot' of influence over the pace of work. This may imply that allowing employees greater control over work practices is not sufficient to bolster productivity, and that such systems would probably benefit more if they were coupled with other incentive schemes. None of the 'employee control' variables had any influence on productivity levels.

Table 2. Relative productivity and productivity growth

Model :	1	2	Model :	1	2
# obs :	947	1010	# obs :	947	1010
Depvar:	plvl	pgth	Depvar:	plvl	pgth
Industrial relations			*Workplace characteristics (continued)*		
uden	0.13	0.39	pt	-0.13	0.21
	(0.92)	(2.87)		(-1.16)	(1.74)
scheme	0.08	0.16	manpro	0.00	0.00
	(0.92)	(1.90)		(-1.16)	(1.07)
emprel	0.47	0.18	clesal	0.11	-0.09
	(6.13)	(2.23)		(0.59)	(-0.44)
unions	-0.04	0.00	maclab	0.30	0.22
	(-1.09)	(0.12)		(2.89)	(2.12)
auto1	-0.03	0.07	*Economic incentives*		
	(-0.33)	(0.62)	share	-0.02	-0.01
auto2	0.04	0.05		(-0.61)	(-0.30)
	(0.43)	(0.49)	perpay	0.02	0.04
auto3	-0.03	-0.23		(0.91)	(1.94)
	(-0.31)	(-2.78)	*Industry*		
auto4	-0.09	-0.10	manu	0.21	-0.12
	(-0.77)	(-0.77)		(1.13)	(-0.76)
auto5	-0.04	0.04	egw	0.24	0.20
	(-0.38)	(0.28)		(0.91)	(0.69)
agree	0.01	0.11	public	0.62	0.68
	(0.14)	(1.30)		(2.22)	(2.63)
cont	0.11	0.00	cons	0.20	-0.52
	(1.41)	(0.02)		(0.89)	(-2.60)
action	-0.08	-0.02	trad	0.28	0.11
	(-0.80)	(-0.21)		(1.41)	(0.53)
orgch	0.08	0.48	tran	0.42	-0.28
	(0.83)	(5.55)		(1.75)	(-1.34)
train	0.14	0.21	comm	-0.16	0.30
	(1.61)	(2.51)		(-0.60)	(1.21)
goals	0.07	0.31	finc	0.32	-0.12
	(0.68)	(3.08)		(1.62)	(-0.59)
overaw	0.08	-0.08	recr	0.43	0.15
	(0.92)	(-1.01)		(2.06)	(0.74)
Workplace characteristics			*Boundary parameters*		
onewp	-0.15	0.23	μ_1	-1.73	-0.71
	(-1.63)	(2.41)		(-5.80)	(-2.48)
emp	0.00	0.00	μ_2	-0.71	-0.08
	(-1.03)	(0.22)		(-2.40)	(-0.28)
lbrcst	0.02	0.11	μ_3	0.44	0.88
	(0.11)	(0.60)		(1.50)	(3.12)
caputi	0.43	0.23	μ_4	1.57	2.19
	(4.64)	(2.46)		(5.23)	(7.62)
compet	-0.13	0.16	*Log L*	-1220.4	-1158.24
	(-1.26)	(1.69)			

t-statistics in parentheses

4.2. *Economic incentives*

Industrial relations matters have not been the sole areas of interest as to what makes some workplaces more productive than others. The use of economic incentives for employees to

improve their performance has also been a subject of interest, particularly the adoption of profit sharing and employee share ownership plans (ESOP's).[8] Profit sharing has been hypothesised to boost productivity through increasing worker effort, improving labour skills and improving information dissemination within the workplace (Kruse, 1992). Evidence from UK, German and US firm level studies support this hypothesis (Black and Lynch, 1997; Cable and Wilson, 1989, 1990; Kruse, 1992; Wadhwani and Wall, 1990).

However, an examination of the estimates here suggests that the same does not necessarily hold for Australia. Although it was not possible to examine the effect of profit sharing on productivity in the 1995 AWIRS, economic incentives in the form of ESOPs and performance based pay were estimated. The coefficients on the ESOP variable were of the incorrect sign, although neither of these estimates were significant. A possible reason why the coefficients on the *share* variable were insignificant is that the sheer size of listed companies could result in an employee not considering their contribution significant enough to influence the overall outcome. Therefore, even if employees are involved in such schemes it may have little impact on their effort. The results for *perpay* were a little better. While there was no apparent effect on productivity levels, the results do seem to suggest that such a system can positively influence productivity growth. The poor estimates for productivity levels could be due to several factors. Firstly, the pay incentives may not be high enough to promote greater worker effort. Secondly, if the majority of employees work in teams, it could introduce incentive problems. Pay that is based on team performance may come up against the "free rider" problem, thereby reducing the effectiveness of such a scheme. Pay that is based on individual performance could encounter problems with how to effectively measure individual performance, which would also limit the effectiveness of such a scheme in boosting productivity.

4.3. Workplace characteristics

A range of other workplace characteristics have also been incorporated, some of which serve as control variables, and some that are actually expected to influence productivity.

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[8] For an extensive examination of the effect of ESOP's on firm performance, see the Standing Committee on Employment, Education and Workplace Relations website, http://www.aph.gov.au/house/committee/eewr/ESO/index.htm. It contains information on the *Inquiry into Employee Share Ownership in Australian Enterprises*. Forty-two submissions were received from a range of individuals and organisations.

Workplaces that operate in a competitive environment are theorised to have better productivity performances, although the theoretical reasons given are 'not overwhelming' (Nickell, 1996). Nickell (1995) argues that the positive influence of competition is transmitted through either an increase in managerial and/or worker effort, or through greater innovation. Managerial effort is expected to increase if the market is only able to estimate the ability of the manager indirectly, *i.e.* through firm performance. If the choice of effort depends on how an increase the firm's output increases the market expectation of a manager's ability, then a greater number of firms (implying greater competition) could lead to greater managerial effort. Competition can increase employee effort if product market rents are shared with workers. The impact on innovation is more ambiguous. On the one hand, a competitive firm gains more from innovation than a monopoly, but a monopoly can deter potential entrants by investing in new developments.

The empirical evidence on this issue reflects the theoretical ambiguity. Nickell *et al* (1992) and Nickell (1996) find that competition has a positive effect on both the level and growth of total factor productivity (TFP). Both studies utilise an unbalanced panel data set on UK manufacturing firms. On the other hand, Blanchflower and Machin (1996) find very weak evidence of a positive association between product competition and labour productivity. Using the 1989/90 AWIRS and the British counterpart, WIRS3, they found that the only positive significant finding was for Australian manufacturers, *i.e.* there was no discernible effect on Australian firms in non-manufacturing industries, or on any UK firms. Although it is not possible to make a direct comparison between the TFP estimates of Nickell and the labour productivity estimates of Blanchflower and Machin, the channels through which it is hypothesised that competition will work does imply a positive outcome for labour productivity. However, the results presented here—like Blanchflower and Machin—suggest that there is little significant effect on labour productivity (either levels or growth) from competitive forces. The coefficient on *compet* was negative and insignificant for productivity levels, but positive and only weakly significant (10 per cent level) for productivity growth.[9] This suggests, for Australian workplaces at least, other characteristics have a greater influence over productivity performance than the intensity of competition faced by the workplace.

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[9] The difference in the results for productivity levels and growth is broadly in line with that found by Nickell (1996) who reports that his estimations reveal that competition is more important for TFP growth than levels.

One-workplace organisations were more likely to have achieved productivity growth than multiple workplace organisations. This may be partly due to the relative ease with which management are able to adequately co-ordinate efforts to improve productivity when they only have one workplace to concern themselves with, rather than trying to apply one set of rules across workplaces. It is possible that these workplaces are simply 'catching up' to the level of productivity found at competing workplaces, as the coefficient on *onewp* for model one (productivity levels) was negative, and approaching significance at the 10 per cent level. *Onewp* may also be capturing some of the information contained in the competitiveness variable, as it is probably fair to assume that one-workplace businesses are likely to face a greater degree of competition than firms that have multiple workplaces.

Workplaces that reported they were operating 'a lot' above capacity utilisation were more likely to have experienced higher levels of productivity than two years ago, and compared to that of their rivals (a result also found by Drago and Wooden (1992)). This is to be expected, since a workplace that is making full use of all resources is highly likely to be more productive than those that are not.

Model one suggests that being located in 'public' services, such as government administration, education or health, recreational services and transport (although the evidence is much weaker here) appeared to increase the chances of having higher levels of productivity (as compared to that reported for the omitted category, mining). Workplaces in public services also reported a substantial increase in productivity growth, whereas those located in the construction industry were more likely to have had a decline in productivity over the past two years.

Black and Lynch (1997) utilise a matched sample of two US surveys—the *Educational Quality of the Workforce National Employers Survey* and the *Bureau of the Census' Longitudinal Research Database*—which provides a comprehensive dataset with which to work. One of the findings that they emphasise is that higher productivity is associated with *how* a work practice is implemented, rather than whether or not it is adopted. This finding also has support elsewhere in the literature. Using data from the AWIRS, Alexander and Green (1992) find that the impact of joint collaboration between management and employees on productivity relies on the 'intensity' of such collaboration, internal consistency, and consistency with other objectives. In a review of 17 US studies, Kling (1995) finds that the use of comprehensive systems of work practices is associated with higher levels of firm

productivity than implementing such work practices individually. Such evidence suggests that the variables considered in this paper cannot be considered in isolation as methods with which to raise productivity, but are likely to be more successful if utilised as a group.

5. Conclusion

The results presented in this paper support the general conclusions reached by other authors investigating productivity, that is, workplace practices—particularly the organisation of work—matter for labour productivity. This suggests that there are a number of issues at the workplace that management can directly address in order to improve labour productivity and workplace efficiency. Some of the more interesting findings in regards to this issue include the observation that good management/employee relations are positively associated with higher labour productivity at the workplace level, as is the setting of goals by management. Training was another factor found to assist workplaces attain higher rates of productivity growth. However, allowing employees control over the pace of work appeared to increase the probability of a workplace having poor productivity growth outcomes. This is not to suggest that permitting employees greater control over work practices is a bad idea (and that a greater degree of management control may work more effectively). Rather, it may be that such systems need to be linked to other employee incentive schemes if they are to be of any benefit.

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Appendix

Appendix Table 1: Productivity compared to 2 years ago (selected characteristics, %).

	A lot higher	A little higher	About the same	A little lower	A lot lower
Industry					
Mining	34	49	14	4	0
Manufacturing	25	48	21	5	2
Electricity, gas, water	47	41	7	4	1
Construction	16	43	32	8	1
Wholesale, retail trade	42	41	12	4	1
Transport, storage	25	49	21	4	1
Communication	51	40	4	3	1
Finance, business	42	35	18	4	1
Public services	37	46	15	2	1
Recreational services	36	39	19	5	1
Workplace characteristics					
Predominantly Australian owned	35	43	17	4	1
No	34	44	16	4	1
One workplace organisation	37	44	15	4	1
No	25	38	28	7	3
Commercial workplace	34	43	18	5	1
No	38	44	15	2	1
Predominantly export	33	41	25	1	0
No	32	42	18	6	1
Strong/intense competition	34	42	19	4	1
No	30	47	14	7	2
Workplace more than 50 years old	37	42	16	3	1
No	34	43	17	4	1
Labour cost greater than 80% of total	36	44	16	3	0
No	34	43	17	4	1
Above capacity utilisation	47	38	12	2	2
No	31	45	19	5	1
Workplace made profit	33	43	18	5	1
No	31	44	17	6	2
< 60% managers & professionals	35	43	17	4	1
> 60% managers & professionals	36	43	19	3	0
< 60% para-profs & trades	35	43	17	4	1
> 60% para-profs & trades	29	46	19	5	1
< 60% clerks & salespersons	33	44	17	5	1
> 60% clerks & salespersons	43	40	15	2	1
< 60% machine operators, labourers	36	43	16	3	1
> 60% machine operators, labourers	29	42	21	7	1
0 to 10% female	30	46	19	5	1
10 to 30% female	30	46	17	5	2
30 to 50% female	39	41	14	5	1
above 50% female	34	44	17	4	1
0 to 25% part time	34	44	17	4	1
25 to 50% part time	31	48	17	3	1
50 to 75% part time	34	47	16	3	1
above 75% part time	44	31	19	4	2
20 to 99 employees	32	42	19	5	2
100 to 249 employees	39	44	13	3	0
250 to 499 employees	37	49	11	1	1
500 to 749 employees	37	42	19	1	1
750 to 999 employees	38	50	12	0	0

	A lot higher	A little higher	About the same	A little lower	A lot lower
1000 plus employees	44	39	11	6	0
Economic incentives					
No employees received performance based pay	33	45	17	4	1
1 to 9% received performance based pay	35	39	20	6	1
10 to 25% received performance based pay	38	38	18	5	1
26 to 50% received performance based pay	40	37	19	1	3
51 to 75% received performance based pay	35	46	19	0	0
76 to 99% received performance based pay	44	39	11	3	3
All employees received performance based pay	40	40	14	4	1
No employees own shares	34	43	18	4	1
1 to 9% own shares	43	39	15	2	0
10 to 25% own shares	32	48	18	0	2
26 to 50% own shares	39	43	14	4	0
51 to 75% own shares	45	40	11	4	0
76 to 99% own shares	26	62	10	0	3
All employees own shares	55	36	0	9	0
Industrial relations					
More than 5 schemes in place	41	42	12	3	1
No	32	44	19	5	1
Groups in place	36	44	16	4	1
No	31	41	21	6	2
Appraisal at least once a year	30	44	21	4	1
No	37	43	15	4	1
Very good employee/management relations	40	38	17	4	1
No	32	46	17	4	1
A lot of employee influence over work allocation	36	45	15	3	1
No	35	43	17	4	1
A lot of employee influence over job performance	37	42	16	4	1
No	33	44	18	4	1
A lot of employee influence over work pace	35	42	17	5	1
No	35	44	16	4	1
A lot of employee influence over wkplc management	37	42	16	4	1
No	35	43	17	4	1
A lot of employee influence over work times	39	41	15	3	1
No	34	43	17	4	1
Any written agreements	34	40	20	5	1
No	35	46	14	3	1
Any employees on individual contracts	34	43	17	5	1
No	35	43	17	4	1
Industrial action in the past year	34	46	15	4	1
No	35	42	18	4	1
Any employees receive over-award pay	32	43	20	4	1
No	37	44	14	4	1
Management plan for corporate goals	37	44	15	3	1
No	23	36	31	8	2
Very good delegate/management relations	38	43	15	2	1
No	33	49	14	4	1
Benchmarking against other workplaces	39	42	15	4	1
No	26	46	22	5	1
Prefer quality improvement to labour cost reduction	38	41	15	4	2
No	33	44	17	4	1
Union recognition	40	40	15	5	0
No	29	37	23	7	3
Time to learn job	31	42	21	5	1
No	36	44	15	4	1
Investment over past 2 years	37	43	16	3	1

	A lot higher	A little higher	About the same	A little lower	A lot lower
No	33	43	18	5	1
Organisational change over past 2 yrs	38	43	14	4	1
No	17	44	33	5	1
Formal training for emps in last year	37	44	14	4	1
No	28	41	24	5	2
No awards	38	37	16	9	0
One award	38	40	17	5	1
Two awards	32	44	20	4	1
Three awards	31	50	14	3	2
Four awards	31	45	18	6	1
5 to 10 awards	37	44	17	2	1
over 10 awards	42	42	11	3	2
No unions	32	38	21	7	2
One union	35	40	19	5	1
Two unions	34	46	17	3	1
Three unions	37	48	12	2	0
Four unions	32	52	13	1	1
Five unions	41	46	10	2	2
over 6 unions	38	44	10	6	1
Union density is 0	32	38	21	7	2
Union density is 0 to 25 %	33	41	21	3	2
Union density is 25 to 50 %	33	45	18	3	1
Union density is 50 to 75 %	33	48	16	2	0
Union density is above 75 %	37	47	13	2	0
Union density is 100 %	37	39	15	6	3
0 to 1% absenteeism	35	41	17	5	2
1 to 2% absenteeism	37	42	17	3	1
2 to 3% absenteeism	37	44	14	4	1
3 to 4% absenteeism	31	51	13	3	1
4 to 5% absenteeism	38	45	12	4	1
above 5% absenteeism	34	41	20	3	2

Appendix Table 2: Productivity compared to competitors (selected characteristics, %).

	A lot higher	A little higher	About the same	A little lower	A lot lower
Industry					
Mining	13	31	36	17	3
Manufacturing	11	34	35	16	4
Electricity, gas, water	13	39	41	6	2
Construction	8	37	45	7	2
Wholesale, retail trade	16	36	39	7	2
Transport, storage	11	37	33	14	5
Communication	11	27	29	32	2
Finance, business	13	38	43	5	0
Public services	13	34	44	7	2
Recreational services	25	31	35	8	1
Workplace characteristics					
Predominantly Australian owned	15	34	39	10	2
No	12	38	38	10	2
One workplace organisation	14	34	39	11	2
No	15	36	40	7	2
Commercial workplace	14	35	37	11	2
No	15	33	43	7	2
Predominantly export	13	26	35	23	3
No	15	36	38	9	2
Strong/intense competition	14	35	38	11	2
No	17	32	34	16	1
Workplace more than 50 years old	14	33	39	11	3
No	15	35	39	10	2
Labour cost greater than 80% of total	13	33	46	6	2
No	15	35	38	11	2
Above capacity utilisation	24	41	28	7	1
No	12	33	42	11	3
Workplace made profit	16	36	36	11	2
No	11	32	39	14	3
< 60% managers & professionals	15	35	38	10	2
> 60% managers & professionals	12	31	50	6	1
< 60% para-profs & trades	14	35	39	10	2
> 60% para-profs & trades	18	28	42	10	1
< 60% clerks & salespersons	13	34	39	11	2
> 60% clerks & salespersons	19	37	36	8	1
< 60% machine operators, labourers	15	35	39	9	2
> 60% machine operators, labourers	11	31	39	15	4
0 to 10% female	13	31	38	14	3
10 to 30% female	10	33	43	11	3
30 to 50% female	15	36	36	10	3
above 50% female	13	35	38	12	2
0 to 25% part time	13	35	38	12	2
25 to 50% part time	14	36	39	8	4
50 to 75% part time	14	35	40	11	0
above 75% part time	24	27	42	5	2
20 to 99 employees	16	34	39	9	2
100 to 249 employees	15	33	41	9	2
250 to 499 employees	12	33	35	18	1
500 to 749 employees	8	44	32	12	5
750 to 999 employees	9	33	36	21	0
1000 plus employees	12	40	31	15	2
Economic incentives					
No employees received performance based pay	14	33	40	11	2

	A lot higher	A little higher	About the same	A little lower	A lot lower
1 to 9% received performance based pay	15	38	36	10	1
10 to 25% received performance based pay	21	31	38	8	2
26 to 50% received performance based pay	17	43	33	5	2
51 to 75% received performance based pay	19	33	44	5	0
76 to 99% received performance based pay	12	42	36	10	0
All employees received performance based pay	10	37	38	13	3
No employees own shares	15	34	39	10	2
1 to 9% own shares	23	33	37	2	5
10 to 25% own shares	7	40	37	14	2
26 to 50% own shares	23	35	35	4	4
51 to 75% own shares	15	30	36	13	6
76 to 99% own shares	11	41	35	14	0
All employees own shares	9	27	45	18	0
Industrial relations					
More than 5 schemes in place	16	36	34	12	2
No	14	33	41	9	2
Groups in place	14	36	37	10	2
No	16	29	45	9	1
Appraisal at least once a year	14	33	41	10	2
No	15	35	38	10	2
Very good employee/management relations	21	36	36	5	1
No	11	33	40	13	3
A lot of employee influence over work allocation	13	33	42	10	2
No	15	35	38	10	2
A lot of employee influence over job performance	15	35	39	9	2
No	14	34	39	11	2
A lot of employee influence over work pace	16	33	40	9	2
No	13	36	38	11	2
A lot of employee influence over wkplc management	13	35	39	9	2
No	15	34	39	10	2
A lot of employee influence over work times	12	41	38	8	2
No	15	33	39	10	2
Any written agreements	16	32	42	8	2
No	13	37	36	12	2
Any employees on individual contracts	16	34	40	9	2
No	14	35	39	11	2
Industrial action in the past year	13	32	38	14	3
No	15	36	39	8	2
Any employees receive over-award pay	14	36	39	10	2
No	15	34	39	10	3
Management plan for corporate goals	15	35	38	10	2
No	13	33	44	8	3
Very good delegate/management relations	15	34	39	12	1
No	12	34	38	13	3
Benchmarking against other workplaces	14	36	38	10	2
No	16	30	42	10	3
Prefer quality improvement to labour cost reduction	19	36	34	10	2
No	13	34	41	10	2
Union recognition	20	35	38	5	2
No	19	38	35	7	1
Time to learn job	13	33	42	10	2
No	15	35	37	10	2
Investment over past 2 years	18	32	37	11	2
No	12	36	40	9	3
Organisational change over past 2 yrs	15	35	38	10	2
No	12	33	44	9	1

	A lot higher	A little higher	About the same	A little lower	A lot lower
Formal training for emps in last year	14	36	38	10	2
No	18	29	42	9	2
No awards	16	38	35	6	4
One award	15	38	37	9	1
Two awards	14	31	42	11	2
Three awards	16	34	36	12	2
Four awards	16	29	42	11	1
5 to 10 awards	11	34	41	10	3
over 10 awards	12	37	37	11	4
No unions	18	37	36	7	2
One union	16	35	39	9	1
Two unions	13	33	42	11	2
Three unions	12	32	42	10	3
Four unions	11	31	38	17	3
Five unions	7	34	34	19	7
over 6 unions	15	38	30	14	3
Union density is 0	19	37	36	7	2
Union density is 0 to 25 %	15	34	36	13	2
Union density is 25 to 50 %	15	39	34	11	1
Union density is 50 to 75 %	13	30	40	13	3
Union density is above 75 %	15	33	38	11	3
Union density is 100 %	12	34	40	13	1
0 to 1% absenteeism	14	35	40	11	1
1 to 2% absenteeism	17	33	39	9	3
2 to 3% absenteeism	17	32	39	9	2
3 to 4% absenteeism	11	35	37	15	2
4 to 5% absenteeism	9	40	34	13	3
above 5% absenteeism	13	34	37	16	1