Can We Explain Australian Labour Productivity Growth? Some Evidence from AWIRS

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In recent years the productivity performance of the Australian economy has been extraordinary. For example, in terms of labour productivity in the market sector, over the period 1988/89 to 1997/98, labour productivity growth has increased at an average rate of 2.5 percent per year. With the long-term labour productivity growth over the 35 year period since the mid-1960s to the late 1990s of around 1 percent per annum, the recent performance breaks with the past and evidence is mounting to show that it is not a short-run phenomenon. This paper uses two large data sets, the Australian Workplace Industrial Relations Surveys of 1990 and 1995, to empirically test some of the theoretical determinants of labour productivity growth in the Australian context. Amongst these are organisational and technological change factors, the influence of unions and the recent move towards enterprise bargaining and away from the award system of determining wages and working conditions, workplace reforms and innovations, the competitive environment in which the workplace operates, and the impact of downsizing. Also tested is the impact of human capital formation, and the influence of economic incentives such as profit sharing and performance related pay. While the paper provides strong support for the importance of organisational and technological change, work restructuring and workplace innovations, and the development of human capital, it provides little support for the independent influence of unions and the introduction of enterprise bargaining, or the use of economic incentives. Downsizing is identified as a positive influence on assessed productivity growth, but only in the context of workplace employment reductions that were intentionally carried out to improve economic efficiency, rather than, for example, to respond to falling market demand.

1. Introduction

In recent years the productivity performance of the Australian economy has been extraordinary. For example, in terms of labour productivity in the market sector, over the period 1988/89 to 1997/98, labour productivity growth has increased at an average rate of 2.5 percent per year. With the long-term labour productivity growth over the 35 year period since the mid-1960s to the late 1990s of around 1 percent per annum, the recent performance breaks with the past and evidence is mounting to show that it is not a short-run phenomenon (Parham, 1999). The growth over the period 1988/89 to 1997/98 has been particularly strong in mining, electricity, gas and water, and communications, each in excess of 6 percent per annum; finance and insurance, manufacturing, and wholesale trade have also shown strong labour productivity growth over this period, in excess of the average of 2.5 percent

across all market sectors. Accommodation, cafes and restaurants, cultural and recreational services and retail trade showed relatively low labour productivity growth over this period, possibly reflecting innate characteristics of these industries (Productivity Commission, 1999).

The factors driving these higher rates are now a subject of much interest and debate. Commonwealth Treasury (1999) attributes the current performance to sound macroeconomic policy and microeconomic reforms aimed at increasing the responsiveness and flexibility of the economy. In the labour market, the drive to increase flexibility commenced in the mid 1980s with the implementation of two-tiered wage bargaining, where second tier increases were linked to trade-offs, such as award restructuring and multi-skilling (Macklin *et al*., 1992). In 1991 this new policy direction stepped up a gear with the introduction of enterprise bargaining. Subsequent industrial relations legislative amendments have focussed on promoting enterprise bargaining and deregulation as key components of the workplace reform/workplace productivity policy. Recent ('second wave') reforms tabled by the Hon. Peter Reith, for example, aim to further curb union power and "... encourage the use of agreements ... to achieve improved productivity and competitiveness ..." (Reith, 1999). All this presupposes there is a link between industrial relations reform and workplace productivity. However, Rimmer (1998) and Hawke and Drago (1998), the latter drawing on the 1995 Australian Workplace Industrial Relations Survey (AWIRS95), could not establish a significant link between enterprise bargaining and improved workplace performance.[1] Internationally the catalyst for enhanced workplace flexibility has been the development of new management theories and the imperatives associated with globalisation (Regini, 1992).

Clearly overall productivity growth arises from a variety of sources, including trade liberalisation (Edwards, 1997), R&D expenditure (Woolfgang, 1997 and 1999) capital investment (Birnie and Hitchens, 1998), the use of technology such as computers (Sichel, 1999; Black and Lynch, 1997), downsizing (Turnbull, 1989)[2], profit-sharing schemes (Estrin, Perotin and Wilson, 1995) unionism (Freeman and Medoff, 1984; Metcalf, 1989; Nolan and Marginson, 1990; and Denny, 1997) and general strategic management approaches (Kochan, McKersie and Capelli, 1983). Isolating the determinants of productivity growth is therefore a difficult, if not impossible, task. Problems such as direction of causality and endogenity plague the empirical research. Recent work by the Productivity Commission (1999), for example, shows that training is more prevalent in workplaces with strong labour productivity growth. The researchers, however, are unable to say whether or not training is a determinant or a product of the strong productivity growth.

In this paper we provide a general insight into some of the most important determinants of workplace labour productivity in Australia. The paper is structured as follows. First we review previous studies in the area. Thereafter

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[1] The term 'enterprise bargaining' was used here in a generic sense to refer to individual bargaining, direct bargaining (collective without union involvement) and collective bargaining (with union involvement).

[2] Although the gains from downsizing may only be short-term (Denny, 1997).

we introduce the data and discuss the methodological approach, present the results before drawing conclusions.

2. Determinants of Productivity Growth

As mentioned in the introduction, the determinants of productivity are varied and their relationships with one another complex. They include the policy environment, product market conditions and workplace level determinants such as general strategic management approaches. The following diagram (Figure 1), as developed by the Productivity Commission (1999) helps conceptualise the determinants and linkages in the process.

The major determinants have been classified as follows: 'immediate causes', 'underlying factors' and 'fundamental influences'. Immediate causes include those which directly impact on productivity at the workplace level (e.g. capital (human and physical) investment, management strategies, industrial relations climate, production arrangements etc.). Factors which might be considered to affect the decisions taken at the workplace level ('underlying factors') include, for example, the degree of competition in the product market. This, in turn, is influenced by the policy environment ('fundamental influences'), such as trade policy, competition policy, wages policy etc. The policy climate and institutional structures also have a direct bearing on workplace decision making and, thus, productivity outcomes.

As the determinants of productivity growth are so varied it is not possible to provide an exhaustive review or to empirically model all facets. Instead we confine our focus to a selection of immediate, underlying and fundamental influences, where the data from the various AWIRS questionnaires suggests the possibility of testing specific hypotheses as set out in Figure 1.[3] Before discussing the models to be employed in this study, however, the issue of how productivity growth is measured in the AWIRS needs to be addressed.

[3] Readers who may be interested in the full range of issues associated with Figure 1 are referred to the report by the Productivity Commission (1999) for further details.

Figure 1

An overview of major productivity determinants

PRODUCTIVITY IMPROVEMENT

Immediate Causes

- Technological advance
- Accumulation of human capital
- Accumulation of Physical Capital
- Scale, scope and specialisation
- Firm organisation, management practices and work arrangements
- Resource allocation
- Plant/firm turnover within industries.

Underlying Factors

- Competition
- Openness
- Demand and Supply

Fundamental Influences

- Policy environment
- Institutions
- Social Capability

Source: Productivity Commission (1999), Appendix B, Figure B.1, p.155

3. Labour Productivity Growth: Examined.

3.1 Data, Methodology and Variable Description

In this section we explore in more detail, the theoretical and empirical determinants of growth in workplace productivity, using data from the Australian Workplace Industrial Relations Surveys of 1989/90 and 1995 (AWIRS90 and AWIRS95).[4] AWIRS95 comprised both cross-sectional data, collected from 2001 workplaces with 20 or more employees, and longitudinal data in the form of a panel of workplaces first surveyed in 1989/90 and then again in 1995, comprising 698 workplaces. Because of missing values in several key variables (particularly on the measure of union density), the sample size reduced to 1658 for the main 1995 survey, and 588 for the panel. This study builds on previous work in the area by Crockett et al (1992), Nunes et al (1994), Rodgers (1998,1999), Hawke and Drago (1998), Loundes (1999), and Laplagne and Bensted (1999). This section details the data and methodology used in this paper, and discusses the development of the set of

[4] The surveys are described in detail in Callus et al. (1991) and Morehead et al.(1997).

variables used to explain labour productivity growth. Firstly, however, the section looks at the measure of productivity used.

3.2 Measures of Productivity Growth

The analyses to follow hinges critically on the usefulness of the AWIRS measure of productivity growth. Although only the measure of labour productivity growth is used in this study, AWIRS95 produced also a measure of comparative labour productivity level in relation to the workplace's major competitors. Concentrating on the labour productivity growth measure, for both the 1995 Main Survey and the Panel Survey, the dependant variable in the models developed was constructed from the subjective assessment of the General Manager to the following question: How would you generally describe labour productivity at this workplace compared with 2 years ago? The overall response for the main survey appears in Table 1.

Table 1 Labour Productivity Growth over the Last 2 Years

	Code	Count	Percentage
A lot lower	5	22	1.1
A little lower	4	79	4.1
About the same	3	329	16.9
A little higher	2	841	43.2
A lot higher	1	678	34.8
Total		1949	

This, and responses leading up to this response, raise several issues, the first of which is whether any credence can be placed in such subjective assessments, to be used in place of actual measures of labour productivity growth. Rimmer and Watts (1994) set out the case for placing little credence on responses to survey questionnaires, using the example of workplace productivity. Laplagne and Bensted (1999) and Loundes (1999) provide an extended defence of the use of the responses to both the questions on comparative level of productivity and on the growth in productivity over the last two years questions. Since the current study deals only with the productivity growth issue and not the level of labour productivity, it avoids the criticism that, in making comparisons with the productivity levels of major competitors, general managers would have little access to rival measures of productivity, or of the methods by which they were constructed. Here, general managers need have knowledge only of the operating efficiency of their own workplace over the last two years, and need no knowledge of the operating efficiency of their main competitors.

In answer to the obvious tendency of general managers to assess the productivity growth over the last two years in their own workplace towards the higher levels of productivity growth in the last two years (fully 78% of the responses were either 'A little higher' or 'A lot higher'), this study relies on the defence used in previous studies. The existence of a response bias does not

preclude statistical analysis as long as the ranking of outcomes is preserved and the extent of the bias is not correlated with any of the explanatory variables (see Crockett et al, 1992 and Laplagne and Bensted (1999) p 18). It could also be argued, that the defect of the respondents wishing to create a 'good impression' to their inquisitor (Rimmer and Watts, 1994) can be easily exaggerated, given that those being interrogated were general managers of, in many cases, quite large workplaces, they would have been aware that their responses were never to be reported except anonymously, and that their inquisitors were likely to have been relatively junior employees of the survey company.

There are, however, some additional issues that remain to be addressed. In response to the question 'Are there any procedures in place which regularly measure labour productivity at this workplace?', 535 out of 2001, or 26.8% of general managers answered in the negative. In a further question to those who answered that their workplace does regularly measure labour productivity, concerning how management regularly measures productivity at the workplace (Question D10), a further 325 or 16.2% of the full sample, responded specifically that labour productivity was not measured (see Table 2). Taken together, these responses suggest that approaching fully one half of workplaces did not specifically measure labour productivity. This might suggest the analysis be carried out only for the roughly half of the workplaces that specifically measured labour productivity. On the other hand, general managers would be expected to have some reasonably accurate idea of whether the efficiency of their labour force was increasing or not, even if they did not have a specific quantifiable measure to hand. If the latter approach is taken, this provides a rationale for including all observations for which an assessment of labour productivity growth was supplied.

Table 2 How Productivity is Actually Measured in the Workplace Main Survey 1995

	Count	Percentage
Physical/actual ratio measure	388	26.5
Other ratio measure	179	12.2
Output/hours/costs/revenue etc.	251	17.2
Not labour productivity	325	22.2
Unclassifiable	320	21.9
Total	1463	

If the argument is accepted that so long as the ranking of outcomes is preserved, that meaningful analyses of the responses to the productivity growth question can be undertaken, further credence could be established if it could be shown that the general ranking of labour productivity growth across workplaces was closely aligned to that of workplaces in the aggregate. Table 3 shows the ranking of the growth of labour productivity by industry sector for

a selection of (ANZSIC) industries for the two years immediately prior to the 1995 AWIRS survey. In Table 3, the industry classifications omitted by the Productivity Commission are those in the non-market sector (eg Government Administration, Health and Community Services, Education and so on).

Table 3 Ranking of Growth of Labour Productivity by Industry Sector 1994-95

ANZSIC Classification	Direction of Growth
Wholesale Trade	Increasing
Electricity, Gas and Water	Increasing
Finance and Insurance	Increasing
Communications Services	Increasing
Mining	Increasing
Accommodation/cafes/restaurants	Increasing
Transport and Storage	Increasing
Manufacturing	Stable
Construction	Decreasing
Retail Trade	Decreasing
Cultural and Recreational Services	Decreasing

Source: Derived from: Productivity Commission (1999), Chapter 3.

Table 4 below shows the ranking of the mean responses of general managers to the Main Survey productivity growth question (Question D11) by industry sector, in descending order of assessed growth. The last column provides an assessment of the correspondence of the mean rankings provided by general managers, and that provided for all workplaces in the industry sector by the Productivity Commission. A '✓' corresponds to a basically correct assessment, not in the sense of a strict correct ranking, but in the sense that the industry has been located in roughly the appropriate ranking, when compared with the aggregate rankings; an '✗' is assessed as an incorrect correspondence. With eight out of eleven 'correct' assessments, the subjective average assessments of general managers corresponds reasonably well to the rankings provided by more objective aggregate measures.

Table 4 Ranking of Assessed Productivity Growth by Industry Sector Main 1995 Survey

ANZSIC Classification in Descending Order of Productivity Growth as Assessed by General Managers	Number of Workplaces	Assessment Against Aggregate Ranking
Communications Services	68	✓
Electricity, Gas and Water	74	✓
Finance and Insurance	93	✓
Retail Trade	161	×
Wholesale Trade	82	✓
Mining	74	✓
Accommodation/cafes/restaurants	99	✓
Cultural and Recreational Services	83	✓
Transport and Storage	96	×
Manufacturing	379	×
Construction	87	✓

Having addressed the various issues surrounding the acceptability of the assessments of labour productivity growth to empirical analysis, we move on to a discussion of the models to be developed.

3.3 The Ordered Probit Model

The basic theoretical model which underlies the analysis to follow is that of a simple production function, where workplace output is related to various inputs. While Laplagne and Bensted (1999) and Loundes (1999) develop a more complete production function model, essentially growth in productivity is hypothesised to be related to the efficiency of inputs, including labour inputs. Productivity growth then, is related to increased efficiency of the labour input, the latter in turn affected by a large range of potential influences, including the industrial relations environment, personal skills development and the organizational framework in which they are fostered, reward systems, and, in fact, the whole gamut of influences embodied in Figure 1. Theory provides little help in deciding which influences to include and which to exclude, so the typical approach in cases such as this is to make a selection of influences which are judged likely candidates, garnered from previous similar studies, and/or from various disciplines (economics, industrial relations, management and so on).

Essentially, productivity growth (y_i^*) is modelled as a function of a set of independent variables (x_i) as in

$$y_i^* = b' x_i + e_i$$

where $e_i = N[0,1]$

Actual productivity growth (y_i^*) is not observed, but is paralleled by the responses to a question on assessed productivity growth (y_i). Since the responses to the question on perceived productivity growth are ordered from 'A lot lower' to 'A lot higher', and since the corresponding appropriate ordered probit model requires y_i to be coded from zero upwards, the dependent variable is recoded so that zero corresponds to 'A lot lower', while four corresponds to 'A lot higher'. This model generates boundary parameters, (m_1, m_2, m_3), which are used along with the x_i parameters in determining the predicted probability of falling in each of the five categories. More formally

$$\begin{aligned} y_i &= 0 \; if \; y_i^* \le m_0 \\ &\quad 1 \; if \; m_0 < y_i^* \le m_1 \\ &\quad 2 \; if \; m_1 < y_i^* \le m_2 \\ &\quad 3 \; if \; m_2 < y_i^* \le m_3 \\ &\quad 4 \; if \; m_3 < y_i^* \end{aligned}$$

Because of the coding on the dependent variable, a positive sign on a parameter increases the probability of being in the highest growth category; conversely, a negative sign increases the probability of being in the lowest growth category. It is also possible to derive from the LIMDEP output, the marginal effects of each independent variable on the probability of the workplace being in each of the five categories (for a more detailed description, see Greene,1995, Chapter 23).

3.4 Explanatory Variables

In line with Figure 1, the models reported encompass a range of hypothesised factors potentially important in explaining productivity growth. Each group is outlined below. Where possible, the same set of explanatory variables used to model the growth of productivity from the 1995 main survey, is used to model productivity growth from the panel. In the latter case, however, there is the opportunity to include additional variables, since there is available the full set of 1990 variables, together with changes in workplace circumstances between the 1990 and 1995 surveys (such as change in union density). In setting out the broad groups of influences on productivity growth, both the variables in the main survey and the panel survey will be addressed. Appendix 1 contains

a more detailed description of the construction, together with means and standard deviations, of all variables used in this study.

3.4.1 Organisational and Technological Change

Management and human resource practices and their effects on workplace productivity have received considerable attention in the management, industrial relations and labour economics literature. The empirical research, however, presents a mixed set of results. The latter reflects, in part, difficulties associated with quantifying the effects, as well as differences in samples (country, industry, firm and time-period) and research methodology.

In the management area it would seem that new work practices may deliver higher productivity, but that there is no precise deterministic relationship. Successful outcomes depend on how practices are actually implemented (Black and Lynch, 1997), with more cooperative or collaborative arrangements tending to lead to better outcomes (Alexander and Green, 1992). Factors that determine successful collaboration, however, remain illusive (Cooke, 1990).

At the same time, it is has long been established that technological improvements are also important determinants of productivity growth. Recent strong productivity growth in the US, for example, may be attributed to the computer and Internet revolution (Sichel, 1999). However, while such revolutionary technologies can and do contribute to enhanced productivity, it would appear that there may be a long learning lag between their adoption and improved productivity growth (David, 1990; Sichel, 1999). Firms require time to learn the intricacies of new computing technologies, determine their capabilities and reorganise production techniques accordingly.

The main 1995 General Management Questionnaire (GMQ95) provided details on the introduction, in the last two years, of new office technology and the introduction of major new plant, machinery or equipment. A positive response to either or both of these questions was taken to identify the workplace as having undertaken technological change. Further questions on organisational change in the last two years included whether major reorganisation of the workplace structure had been undertaken (workplace restructuring), and whether there had been major changes to how non-managerial employees do their work (work restructuring).

For the panel data, a somewhat different set of organisational change variables needed to be constructed, since a decision had been make to parallel the same set of questions in the 1995 panel as had been asked in the 1990 survey and this was a different set to those used in the main 1995 survey. Three of the panel questions, however, allowed almost identical variables to the main survey to be constructed: the technological change variable, the issue of workplace restructuring and the issue of changes undertaken to the way workers carried out their jobs. These are bracketed in

the list of variables in Appendix 1. For the panel, however, several additional variables were available: whether a new product or service had been introduced, whether the workplace had become more commercial in orientation, whether there had been a major reorganisation of the entire workplace structure, and whether there had been a change in the senior management structure.

3.4.2 Workplace Reforms

Amongst the immediate causes of productivity growth, the Productivity Commission identifies advances in theories and practice of firm organization, management and work arrangements, such as lean production techniques, supply arrangements, inventory management, quality assurance, team-based work and so on (Productivity Commission, 1999, p 156). Reforms in workplace practices can complement technological advances by providing working arrangements conducive to the introduction and integration of such advances. Developments in institutional arrangements have been identified in the longer-term to have reduced the cost of transacting in economic life to such an extent that they may have produced productivity gains to rival those of technological advances (North, 1989).

The main 1995 Employee Relations Management Questionnaire (ERMQ95) provided data on a range of reforms introduced in the last two years, comprising formal training scheme, incentive/bonus scheme, semi-autonomous work groups, skills audit, staff appraisal scheme, quality circles, team building, total quality management, computer integrated management and 'just in time'. As well as being considered separately, in line with Rogers (1998), an index of reforms was constructed. Four groups of reforms were identified with each group comprising similar methods. The groups are

- Formal training
- Staff appraisal, skills audit and incentive/bonus scheme
- Quality circles and team building
- TQM, CIM and JIT

By summing the positive responses in each of these categories, a reform index from zero to four was constructed. Similar indices were constructed for the panel, for both 1995 and 1990, although in the former case, only reforms currently in place were available, while in the latter case, the reforms were introduced over the previous five years.

Benchmarking was identified as a separate type of reform, and is included on its own for the main survey.

3.4.3 Training

Although partly covered by one of the reform categories, the importance of human capital development through formal training is recognised in this

variable, constructed from the ERMQ95 from the response to the question 'In the last year, has your organization provided any formal program of instruction for employees that is designed to develop their skills (exclude on the job training, or attendance at conferences, or apprentice training)?' A parallel variable was available for the panel.

Laplagne and Bensted (1999) suggest that although innovation or technological improvements can, on their own, raise productivity, innovation combined with training results in even stronger productivity growth. Their study suggests that training on its own does not appear to affect productivity.

This latter conclusion sits uncomfortably with endogenous growth theory which postulates that human capital accumulation is the catalyst for innovation and productivity growth (e.g. Romer, 1990). However, Laplagne and Bensted (1999, p.32) acknowledge that this result may reflect endogeneity problems; i.e. that productivity levels influence training levels. A further confounding issue is the suggestion that different forms of training (formal *vis a vis* on-the-job) affect labour productivity differently (Barrett and O'Connell, 1998). The links between innovation, training and productivity clearly require further research to disentangle issues such as lag effects, definitional and endogeneity problems.

3.4.4 Economic Incentives

Improved productivity has been a major motive in the adoption of various performance based payment schemes, including profit sharing and share ownership schemes. Responses to questions on payment systems in the ERMQ95 allowed the construction of several variables. The percentage, in the last year, of non-managerial employees actually receiving performance related pay was constructed as a continuous variable by taking the mid-points of the ranges in the responses; Appendix 1 on variable construction supplies more detail. A similar process was carried out for the percentage of non-managerial employees who actually owned shares in a share ownership scheme. Lastly, a dummy variable was constructed to identify whether the workplace operated a profit sharing scheme. On this basis, for the average workplace, around 15% of employees were shown to have some element of performance related pay, 6% owned shares, while about 6% of workplaces had a profit sharing scheme.

Similar variables were constructed for the panel, however rather than a dummy variable identifying whether the workplace operated a profit sharing scheme, a variable identifying the actual percentage of the employees in the workplace receiving any payment from a profit sharing scheme was able to be created. For the panel, for the average workplace, about 12% of employees had some element of performance related pay, 8.7% owned shares, while about 1.5% of employees received a payment in the last year from a profit sharing scheme.

3.4.5 Industrial Relations Environment

The literature on unions and their effects on productivity is voluminous, but remains inconclusive. According to economic theory unions may exert positive and negative effects on productivity outcomes (Freeman and Medoff, 1979,1984). The monopoly model of union behaviour, for example, postulates that unions use their industrial muscle to extract higher wages and, by creating a misallocation of resources, hamper productivity growth. Unions, in this view, are seen as a source of rigidity. The alternative view, based on Freeman and Medoff's (1979, 1984) exit-voice paradigm, suggests a positive role for unions. Under this model dissatisfied workers may remain in the workplace and, via unions, 'voice' their grievances to management. Alternatively, they may quit ('exit'), causing the firm to incur turnover costs as well as lost investments in human capital. Firms who respond to the voice effects may overcome inefficient work practices and experience higher productivity levels.

Empirical studies of the union-productivity effects find mixed results. Studies in the US and UK, for example, find positive or insignificant effect (for the US see Freeman and Medoff, 1984 and Brown and Medoff, 1978. For the UK see Nickell et al., 1992; and Denny, 1997). Others find that unions negatively impact on productivity (for the US see Addison, 1985; Warren, 1985; Chezum and Garen, 1998. For the UK see Metcalf, 1989). Aggregated studies on multi-factor productivity, tend to identify negative effects of unions on MFP (Hirsh and Link,1984). Koeller (1996) identifies union presence with reduced levels of innovation, while Reshef (1993) suggests that technological change is resisted more widely in the presence of union influence. In Australia there has been limited research on the union/productivity question. That which has occurred (based on 1989/90 data) suggests that unions may have had a negative impact (Crockett, Dawkins, Miller and Mulvey, 1992). Uncertainty thus surrounds union/productivity research outcomes. A common critique of such union focussed research is that the quantitative techniques employed fail to capture the 'precise character' of the union/management relations (Alexander and Green, 1992). In other words, they over look the 'social aspects' of the production and employment relationship (Turnbull, 1989).

Most quantitative studies capture union effects via dummy variables measuring union presence, union density etc. Such variables are, however, poor proxies for the power of trade unions and, additionally, are subject to significant measurement error (Denny, 1997). There is also the question of endogeneity - that unionism is jointly determined with productivity-enhancing characteristics (Duncan and Stafford, 1980). In the study to hand, although a number of different union measures were examined (union presence, number of unions at the workplace), none performed better than union density**,** so the empirical results on union influences are couched in these terms**.** Although union density is undoubtedly not necessarily a good measure of union influence, it is generally judged superior to the alternatives of union presence or number of unions. It is also acknowledged, however, that these generally available measures are still unable to quantify and control for the social dimensions of the relationship, as earlier identified by Turnbull (1989).

In the panel, because union density (defined as the percentage of union members at the workplace) is known in both 1990 and 1995, the influence of the change in union density on the assessed growth of productivity in 1994-1995 can be modelled. We would expect that falling union membership, combined with increasing competitive pressure from both the domestic and the international market, would bring about increased workplace flexibility, and hence increased productivity growth.

Table 5 shows the mean point percentage change in union density between the two surveys, broken down by industry sector. Across all panel workplaces, union density dropped from 63.54% in 1990 to 54.03% in 1995, a drop of 9.51%. While all industry sectors saw declines in density, those largely in the non-market sector such as government administration, health and community services saw the smaller reductions, while mining, construction, wholesale trade, accommodation, communication services, and

Table 5 Mean Percentage Change in Union Density 1990-95
By Industry Sector
Main and Panel Surveys,1995

Industry Sector	Mean	Std Dev	Cases
All industries	-9.51	20.73	602
Mining	-12.37	20.70	14
Manufacturing	-9.48	25.18	139
Electricity, Gas & Water	-9.21	30.33	26
Construction	-19.46	18.02	32
Wholesale Trade	-11.31	17.39	18
Retail Trade	-9.46	28.61	57
Accommodation/Cafes/Restaur.	-19.29	33.18	27
Transport & Storage	-9.12	24.39	32
Communication Services	-11.34	23.84	17
Finance & Insurance	-14.25	23.64	30
Property & Business	-4.61	16.93	35
Government Administration	-8.12	20.42	44
Education	-6.08	19.91	39
Health & Community Services	-2.37	20.56	54
Cultural & Recreation Services	-8.60	18.41	15
Personal & Other Services	-7.94	32.92	23

finance and insurance all saw declines in excess of 10%. In the 1990 AWIRS, high union density was associated with lower productivity relative to major competitors; although the current study looks at the growth of productivity, it might be expected lower levels of union membership at the workplace level be associated with assessed higher productivity growth.

In the belief that union influence is more likely to be present where there is an active union presence along with higher density of union members, a derived

dummy variable on union activity is also modelled, for both the main survey and the panel. [5]

As mentioned in the introduction, the industrial relations environment during the period of the 1995 survey, was being influenced by the growth of enterprise bargaining. In the main survey, two variables are included to capture some aspects of this change in the industrial relations environment, firstly, the percentage of workers at the workplace covered by either a verbal or a written enterprise agreement, and secondly, a dummy variable indicating whether or not there had been employee involvement in the drafting of an enterprise agreement. The latter variable was in line with Hawke and Drago (1998), where employee involvement was defined as associated with those agreements which involved consultation with employees in the form of formal employee meetings, informal discussions, ballots, draft agreements being circulated, newsletters/email, consultative committee discussions and other means. This variable was designed to test whether enterprise agreements which explicitly sought employee involvement were more likely to produce higher productivity growth than those negotiated without such employee involvement.

3.4.6 Downsizing

Downsizing, in the sense of workforce reductions, has been a dominant feature of firm behaviour during the 1990s, as it has also been in many OECD economies, and there is a steadily growing set of published research for the Australian economy (Benson and Ieronimo, 1996;Iverson and Pullman, 1997;Littler, 1994,1997; Dawkins et al, 1999). Downsizing and its relationship to firm performance including productivity growth is an ever-present issue in the workplace environment. Although far from ideal, several measures of downsizing can be constructed from the AWIRS. The ERMQ95 asked the question 'Has management intentionally reduced the size of the workforce here at any time in the last year?', from which a simple dummy variable can be constructed. However, the main reasons for reducing the size of the workforce, included 'lack of demand for product/service', as well as 'technological change', 'organisational restructure', 'financial problems', 'government initiated restructuring', and 'decreased costs or increased efficiency'. It could be argued that reducing the workforce because of a lack of demand should not qualify as 'downsizing' in the general usage of the word, given that the term is normally associated with attempts to improve efficiency rather than simply react to reduced demand. While this is a moot point, the downsizing dummy variable used here only has the value one if the workforce was intentionally reduced and the reason was not lack of demand. This is essentially in line with Cameron et al (1993), who define downsizing in terms of an intentionally instituted set of activities designed to improve organisational efficiency and performance which affect the size of the organisation's workforce, costs and work processes.

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[5] See: Department of Workplace Relations and Small Business, (1997),'The 1995 Australian Workplace Industrial Relations Survey (AWIRS 95): Technical Report and data Release. Appendix 3: Derived Variables'.

A further difficulty confronts this variable, since the productivity growth variable refers to a two year period, while the workforce reduction variable refers only to the last year. There is no data available in the AWIRS main surveys on whether the workforce reductions had gone on for longer than one year. However, it may well be the case that workforce reductions act quickly enough on productivity growth to show up in the GMQ95 productivity growth assessment.

The study by Dawkins et al (1999) on restructuring and downsizing in Australia, while directed at the whole enterprise level rather than at the workplace level, models employment changes in three categories, downsizers, stable employers and upsizers. They categorise a downsizing enterprise as one which reduced its workforce by 5% or more for any two consecutive years between 1990 and 1993, an upsizers as one which increased its workforce correspondingly by 5% or more, with the stable category comprising the rest. The AWIRS 1995 main data does not allow the construction of this more sophisticated categorization, since there is available data only on the size of the workforce at the time of the survey, and one year previously. Defining short-term downsizers as those who reduced their employment by 5% or more over the previous year, upsizers as those who increased their employment by 5% or more over the previous year, and those with stable employment as the rest, two additional dummy variables were created. The severe limitations on the construction of these variables, however, warns against placing much weight on the empirical results.

In analysing the panel data, however, there is some scope for looking at longer term downsizing, since the total level of employment at the time of both AWIRS surveys is known. Of the 698 workplaces in the panel, 651 or 93.3% supplied total employment at September, 1989, and total employment at August, 1995. Over this six-year period, over all 651 workplaces, the average total percentage increase in employment was a quite low 3.37%, substantially less than 1% per annum. Table 6 shows the mean percentage difference in total employees across those six years, broken down into industry sectors. The picture is one of major employment growth differences across industry sectors over that period. For example, average employment in manufacturing workplaces declined by 7.8%, with corresponding declines for electricity, gas and water and transport and storage of around 7.3%, wholesale trade of 5.6% and communications services of 14%. Balancing these declines were substantial increases in construction, government administration, education, health and community services, personal and other services, and cultural and recreational services. Notice in all cases, however, that the standard deviations from the mean are generally very large, suggesting wide dispersion in the employment growth experiences of individual workplaces within each of the industries.

Three longer-term downsizing categories, resulting in two dummy variables, were constructed for the panel models. A workplace was categorised as a longer-term downsizer if its employment growth over the six year period was 0% or below, an upsizer if its employment growth over the six year period was greater than 6%, and as stable if its employment grew between 0% and 6%

over the six years. On this basis, fully 60.4% of workplaces were classified as longer-term downsizers, 34.1% as upsizers, with the remaining 5.5% as stable. The substantially different changes in employment patterns can be seen in Table 7, which shows the breakdown by industry sector of the three downsizing categories.

Table 6 Percentage Growth in Total Employment 1989-95
By Industry Sector
Panel Survey 1995

Industry Sector	Mean Percent	Std Dev	Cases
All industries	3.37	88.11	651
Mining	4.20	57.75	14
Manufacturing	-7.83	52.64	144
Electricity, Gas & Water	-7.27	83.41	28
Construction	40.89	247.70	37
Wholesale Trade	-5.61	48.06	19
Retail Trade	-.65	40.83	59
Accommodation/Cafes/Restaur.	-.82	26.40	27
Transport & Storage	-7.39	62.23	36
Communication Services	-14.03	88.24	17
Finance & Insurance	-.66	110.25	32
Property & Business	1.97	59.79	37
Government Administration	11.45	93.67	50
Education	11.27	48.71	45
Health & Community Services	12.40	36.22	64
Cultural & Recreation Services	26.76	174.64	18
Personal & Other Services	9.18	44.17	24

Table 6 shows substantially different patterns of downsizing or upsizing, and the consequent effect on total employment growth across industry sectors. For example, both mining and construction reported high percentages of workplaces which downsized according to the definition, but also a relatively high percentage of upsizers, the overall result being an increase in employment growth across the whole set of mining workplaces in the panel data. By contrast, electricity, gas and water and wholesale trade, with similar patterns of downsizers and upsizers, reported losses in employment across all workplaces. No doubt the varying size of workplaces in combination with the distribution of downsizers and upsizers, plays a significant role in whether employment overall in the industry increases or decreases.

A further dimension of workplace change in employment which might possibly impact on productivity growth, is the changing structure of permanent versus casual, and full-time versus part-time workers (Norris, 1993;Mangan and Williams,1999; Wooden and Hawke,1998). Full-time permanents (who ordinarily work at least 35 hours per week) and part-time permanents (who work fewer hours per week), are entitled to paid holiday or sick leave; full-time casuals (who ordinarily work at least 35 hours per week) and part-time casuals (who work fewer hours per week) are usually not entitled to paid

holiday or sick leave. The increasing casualisation of the workforce, with the resultant diminished attachment to a particular firm or workplace, may discourage not only firms but also individual workers, from undertaking investment in human capital, especially that related to gaining firm-specific skills. Similarly, a move away from full-time employees to part-time

Table 7 Percentage Downsizer, Stable and Upsizer Workplaces 1989-95 By Industry Sector Panel Survey, 1995

Industry Sector	Longer - term Down-sizer %	Longer - term Stable %	Longer - term Up-sizer %	Employ-ment Growth*	Cases
All industries	60.4	5.5	34.1	↑	651
Mining	64.3	0.0	35.7	↑	14
Manufacturing	66.0	6.3	27.8	↓	144
Electricity, Gas & Water	75.0	3.6	21.4	↓	28
Construction	70.3	0.0	29.7	↑	37
Wholesale Trade	68.4	0.0	31.6	↓	19
Retail Trade	57.6	10.2	32.2	→	59
Accommodation/Cafes/Restaur.	63.0	3.7	33.3	→	27
Transport & Storage	61.1	0.0	38.9	↓	36
Communication Services	70.6	11.8	17.6	→	17
Finance & Insurance	68.8	3.1	28.1	→	32
Property & Business	59.5	2.7	37.8	→	37
Government Administration	50.0	8.0	42.0	↑	50
Education	51.1	8.9	40.0	↑	45
Health & Community Services	43.8	9.4	46.9	↑	64
Cultural & Recreation Services	61.1	5.6	33.3	↑	18
Personal & Other Services	54.2	0.0	45.8	↑	24

* ↑ Employment Increasing; ↓ Employment Decreasing; → Employment Stable

employees may also discourage investment in human capital, with the consequent reduction in productivity growth.

On the other hand, increased use of casual and/or part-time workers may increase the flexibility the workplace enjoys in managing its workforce, and so may contribute to higher productivity growth. These propositions can be tested for the panel data, where the breakdown into permanent/casual and full-time/part-time is know at both mid-1989 and mid-1995. This allows the calculation of the percentage change in casual versus permanent workers and also the percentage change in full-time versus part-time workers for each of the workplaces in the panel.

In Table 8, column (1) shows the mean percentage of permanent workers by industry sector, while column (2) shows the point percentage change between 1989 and 1995. Across all industry sectors, the workplaces in the panel

actually show a slight increase in mean percentage of permanent employees. On an industry basis, however, there are significant differences, with manufacturing and wholesale trade showing increased casualisation, but accommodation and cafes, government administration and particularly health and community services showing increased proportions in permanent positions. In general, however, there does not appear to have been a wholesale casualisation of this sample of workplaces in the six year period in question.

Column (3) shows the mean percentage of full-time employees reported in 1989, while column (4) shows the point percentage change between 1989 and 1995. Across all industries, the percentage of full-time employees fell 4.43 percentage points. Again, on an industry basis, there were substantial differences reported. Perhaps surprisingly, the retail trade and accommodation/cafes sectors reported a substantially higher proportion of full-time employees in 1995 than in 1989. Other sectors, particularly finance and insurance and health and community services reported substantially lower percentages of full-time employees in 1995 compared with 1989. As a generalisation however, across all industry sectors, workplaces did not identify large shifts either towards increased casualisation or increased proportions of part-time employment. This is interesting especially in the light of the substantial differences in percentage growth of total number of employees reported in Table 7 above. Again, as a generalisation, while a very high proportion of workplaces were reported as having downsized (according to the definition), this does not appear to have been accompanied by substantial changes to the mix of permanent versus casual or full-time versus part-time employees.

Table 8 Change in Permanent/Casual and Full-time/Part-time by Industry (1989-95) . Panel Survey,1995

Industry	Mean Percent Permanent (1989) (1)	Point Percent Change (89-95) (2)	Mean Percent Full-time (1989) (3)	Point Percent Change (89-95) (4)	Cases
All Industries	85.60	.11	82.52	-4.43	695
Mining	95.58	-.94	97.24	-1.32	16
Manufacturing	94.47	-3.30	95.55	-2.82	149
Electricity, Gas & Water	96.97	-.48	98.79	-1.88	31
Construction	98.41	-1.57	97.31	.07	39
Wholesale Trade	94.87	-2.86	94.07	-4.69	23
Retail Trade	56.55	1.18	56.96	13.56	63
Accommodation/Cafes	41.90	3.60	55.31	16.17	31
Transport & Storage	93.54	-.43	96.56	-2.22	39
Communication Service	97.44	-.04	93.19	-2.97	19
Finance & Insurance	98.16	.42	90.10	-9.90	31
Property & Business	90.95	1.71	87.17	.80	39
Government Administration	93.47	2.72	91.05	-.22	53
Education	85.84	-1.23	73.90	-2.23	49
Health & Community Services	77.05	5.82	53.35	-9.06	67
Cultural & Recreation	54.74	.59	50.10	2.08	21
Personal & Other Ser	97.65	.17	97.19	-1.00	25

3.4.7 Competitive Environment

As with the literature on unions and productivity, there is a similarly large literature examining the effects of competition on productivity. From a theoretical perspective the basic argument suggests that firms operating in markets characterised as near monopolies, or where the threat of potential entrants is minimal, have less incentive to innovate and thus experience slower productivity growth. Conversely, firms operating in highly competitive markets use innovation to achieve a competitive advantage and maintain market share and, in the process, develop efficient and productive production techniques (Caves, Ward, Williams and Wright, 1987). The other perceived advantage of a competitive domestic marketplace is the development of firms which are internationally competitive (Porter, 1990).

A principal counter-argument to the monopoly/market-power position explained above is that market power allows firms the luxury of R&D investment and can support experimentation with different technologies and innovations (Productivity Commission, 1999, p.57). In a similar vein Blandy et al. (1985), suggest that competitive markets characterised by many small sized firms who are unable to influence the market rarely engender the competitive rivalry necessary for the dynamic efficiency gains discussed

above (Blandy et al., 1985). Australian firms producing for a small domestic market are unable to take advantage of economies of scale and, further, have little incentive to ensure that infrastructure such as telecommunications, electricity and so on, are operating efficiently.

Over the last decade and a half, Australian industry policy has made progress in the development of a more competitive and efficient production environment. Tariff barriers have been reduced, thus introducing international competitive pressures. A number of markets such as finance, telecommunications, electricity have been deregulated and competition policy legislation has been enacted. It may be early days to fully gauge the effects of these developments on Australian productivity levels. Available research, however, points towards positive productivity gains. Edwards (1997), for example, shows that more open (OECD) countries experience faster productivity growth. Research on Australian workplaces by Nunes, Crockett and Dawkins (1994, p.85) suggests that firms in the traded goods sector who faced external (overseas) competition were more likely to implement organisational and technical change than other comparable Australian workplaces.

The GMQ95 asks management to rate the degree of competitive pressure for the workplace's major product or service on a six-point scale ranging from limited to intense. It is likely that workplaces facing higher levels of competition would more likely introduce reforms, organisational changes and so on to improve competitiveness, than workplaces faced by little or no competitive pressure. As a second measure of competition, a dummy variable measuring the number of competitors was also entered (few competitors equals one if few competitors, or zero if many or no competitors). For the panel, similar variables are available for both the 1995 and the 1990 surveys.

Both the main and panel surveys also asked whether the nature of the market for the workplace's major product or service was domestic only without import competition, domestic with import competition, primarily an export market or an administrative office. In each case, this was used to create a dummy variable, external competition, equals one if domestic with import competition or primarily an export market, and equals zero if domestic only. This is used to test the assertion that firms in the traded goods sector, facing competition from overseas producers, have a greater incentive to achieve maximum efficiency, and hence be more likely to implement productivity enhancing workplace reforms.

Both the main and panel surveys also identify whether workplaces are in the public or private sectors. It could be asserted that the higher level of competitive pressure in the private sector would encourage private sector firms to introduce workplace reforms at a faster rate than those in the public sector. Consequently, for each case, an appropriate dummy variable for private versus public sector forms one of the explanatory variables.

Whether the workplace faces an expanding or a contracting demand may also influence productivity growth. If firms react to expanding demand by working

increased overtime, or working their capital equipment more intensively, then an expanding demand would be expected to be associated with higher productivity growth. Previous studies tend to confirm this relationship.

3.4.8 Control Variables

Previous studies of workplace productivity using the AWIRS have used a range of workplace control variables that are thought might have some influence on the dependent variable. Little guidance is available in the selection from a very large set of potential control variables. In this study, the following are used. Workplace size may be associated with economies of scale and hence have an influence on productivity growth. The age of the workplace may be a proxy for the age of the capital equipment or the technology in use. Whether the workplace is wholly owned in Australia versus being owned by a trans-national firm may affect the workplace's access to the latest technology or management ideas.

Management-employee relations have been shown in previous studies to have some influence on productivity levels, and are included in this study. High capacity utilisation has also been identified in previous studies to positively influence labour productivity. As pointed out by Laplagne and Bensted (1999), however, *a priori*, the direction of the relationship is uncertain. Increasing the rate at which under-utilised capital and labour are utilised will increase labour productivity, but over-utilising these factors will reduce labour productivity. Capacity utilisation variables are provided for both the main and the panel models, although the construction of the variables differs somewhat, as explained in Appendix 1.

Finally, industry dummies are used to account for different production methods across industries.

4. Results

4.1 Productivity Growth from the Main and Panel Surveys

This study reports on two basic ordered probit models, firstly on the measure of productivity growth for the workplaces which made up the main surveys in the 1995 AWIRS, and secondly on the measure of productivity growth for the workplaces which made up the panel survey. Although many variations of each of these models could be shown with varying combinations of explanatory variables, for the sake of parsimony only two variants of each model are reported. For the same reason, neither the parameters associated with the industry dummy variables nor the threshold parameters are reported.

Table 9 reports the results of two ordered probit models for the main survey, differing only to the extent that Model 2 disaggregates the set of reform variables encompassed in the Reform Index of Model 1. Table 10 reports the results from the ordered probit model for the panel. To keep the results

reasonably compact, both the main and panel models will be considered together.

4.2 Organisational Change

For the main survey, each of the organisational and technological change variables is strongly positively associated with growth in productivity, as hypothesised in Figure 1. In line with international experience (Lehr and Lichtenberg, 1999), the introduction of major new office technology, and the introduction of major new plant machinery or equipment, which constitutes technological change, are seen as strongly associated with higher productivity growth. The same is the case for major reorganisation of workplace structures such as changing the number of management levels or restructuring whole divisions, and major changes to how non-managerial employees do their work, such as changes in the range of tasks done or changes in the type of work done.

The marginal effects of these influences are shown in Table 11. These are couched in terms of the increased probability of being in the highest productivity growth category, if the particular change is present at the workplace. Hence reporting technological change in the last two years increases the probability of being in the highest growth category by 6.74%. The third category, reporting major changes to how non-managerial employees do their work is roughly twice as important as reporting either of the other changes. Clearly since such changes are typically initiated by management, the model identifies a clear role for management initiatives in these areas. Benchmarking is also shown to be a significant explanatory variable, but at the 10% level; its marginal effect is 4.35%, and also clearly should be seriously considered by management in raising productivity growth.

Table 11 Marginal Effects of Technological Change, Workplace Restructuring and Work Restructuring
Main Survey 1995

Organisational change	**Marginal Effect**
Technological change	0.0674
Workplace restructuring	0.0501
Work restructuring	0.1134

Table 9 Growth in Productivity in the Last Two Years
Main Survey, 1995
Dependent variable: Growth in Productivity in Last Two Years

	Model 1		Model 2	
Variable	Coefficient	t-statistic	Coefficient	t-statistic
Organisational Change				
Technological change-95	.187	3.261*	.195	3.344*
Workplace restructuring-95	.139	2.210**	.143	2.246**
Work restructuring-95	.315	5.276*	.307	5.079*
Benchmarking-95	.121	1.901***	.125	1.940***
Workplace Reforms				
Reform Index-95	.067	2.940*		
Formal training-95			-.017	-.255
Semi-autonomous groups-95			.017	.229
Income-bonus scheme-95			.092	1.335
Quality circles/team building-95			.142	2.162**
Staff appraisal-95			-.022	-.354
TQM-95			.039	.574
CIM-95			.236	2.573*
Skills audit-95			-.079	-1.114
JIT-95			.178	1.516
Training				
Training-95	.139	2.067**	.150	2.204**
Economic Incentives				
Percent performance pay-95	.001	1.383	.001	1.326
Profit-share scheme-95	.004	.033	-.010	-.082
Percent share ownership-95	-.001	-.624	-.001	-.617
Industrial Relations Environment				
Union density-95	.0004	.455	.0007	.640
Union active-95	.127	1.714***	.117	1.556
Percent verbal/written agreement-95	-.0004	-.480	-.0004	-.498
Employee involvement in agree-95	.017	.232	.163	.222
Downsizing				
Downsize-95	.153	2.174**	.150	2.115**
Dsize-95	-.033	-.453	-.027	-.364
Upsize-95	.054	.797	.049	.722
Competitive Environment				
Competitive pressure-95	-.013	-.601	-.037	-.608
Few competitors-95	-.112	-1.445	-.117	-1.476
External-95	-.109	-1.388	-.115	-1.443
Demand expanding-95	.198	3.315*	.214	3.541*
Private sector-95	-.102	-0.976	-.092	-.872

Table 9 Growth in Productivity in the Last Two Years
Main Survey, 1995
Dependent variable: Growth in Productivity in Last Two Years
(continued)

	Model 1		Model 2	
Variable	Coefficient	t-statistic	Coefficient	t-statistic
Control variables				
Workplace size-95	.004	.441	.007	.688
Workplace age-95	-.0007	-.558	-.0007	-.523
Multi-national corporation-95	.170	2.115**	.170	2.112**
Head office-95	.089	1.244	.088	1.236
Management-employee relates-95	.157	3.891*	.153	3.770*
Above normal capacity-95	.247	3.587*	.230	3.320*
Constant	.921	3.530*	.935	3.581*
Number of Observations	1658		1658	
Probability > chi-square	.0000		.0000	

Note: * Significant at 1% level; ** 5% level; *** 10% level

Table 10 Growth in Productivity in the Last Two Years
Panel Survey, 1995
Dependent variable: Growth in Productivity in Last Two Years

Variable	Coefficient	t-statistic
Organisational Change		
Technological change-95	.093	.775
Technological change-90	-.183	-1.646
New Management structure-95	-.035	-.302
New Management structure-90	-.012	-.108
Restructure of work-95	.472	4.053*
Restructure of work-90	.170	1.432
New product/service-95	.152	1.107
New product/service-90	.213	1.434
New senior management-95	.215	1.916***
New senior management -90	.112	.968
More commercial-95	.229	1.811***
More commercial -90	-.067	-.527**
Workplace Reforms		
Reform Index-95	.035	.746
Reform Index-90	.080	1.703**
Training		
Training-95	-.004	-.027
Economic Incentives		
Percent performance pay-95	-.003	-1.388
Percent profit-share -95	.012	2.063**
Percent share ownership-95	-.002	-.793

Table 10 Growth in Productivity in the Last Two Years
Panel Survey, 1995
Dependent variable: Growth in Productivity in Last Two Years
(continued)

Variable	Coefficient	t-statistic
Industrial Relations Environment		
Change in union density-90 to 95	.0008	.358
Union active-95	-.075	-.588
Union active-90	-.056	-.477
Percent verbal/written agreement-95	.0001	.698
Negotiation-90	.013	.235
Bargaining-90	.017	.036
Downsizing		
Downsize-95	.100	.866**
Longer term downsizing-90-95	.018	.065
Longer term upsizing-90-95	.021	.077
Point percentage change permanent-90-95	-.001	-.236
Point percentage change fulltime-90-95	-.002	-.459
Competitive Environment		
Competitive pressure-95	-.023	-.650
Competitive pressure-90	-.036	-1.166
Few competitors-95	-.035	-.224
Few competitors-90	-.114	-1.464
External-95	.247	1.610
Demand expanding-95	-.144	-.405
Full capacity-95	.288	2.469*
Private sector-95	.041	.189
Control variables		
Workplace size-95	.019	1.192
Workplace age-95	-.076	-1.368
Multi-national corporation-95	.179	1.162
Head office-95	-.067	-.471
Management-employee relates-95	.139	2.877*
Management-employee relates-90	.103	1.731***
Constant	1.00	1.337
Number of Observations	588	
Probability > chi-square	.0000	

Note: * Significant at 1% level; ** 5% level; *** 10% level

For the set of workplaces in the panel, the effects of organisational change implemented in the two previous years are generally not as strong as for the main survey, with the exception of work restructuring, with a marginal effect of 16.43%. A change to a more commercial environment, and a change in senior management are weakly associated with a higher growth in productivity. In terms of any longer term carry-over of effects of organisational and technological changes that had been undertaken in the five year period before the 1990 survey, little lasting effects are identified. The negative and significant at the 10% level coefficient of technological change reported in 1990 is difficult to explain.

4.3 Workplace Reforms

For the main survey, Model 1 shows that workplaces that reported higher levels of workplace reforms undertaken in the previous two years, as measured by the reform index, also report a significantly higher productivity growth. The marginal effect of an additional increment to the reform index is around 2.5%. Model 2 shows the breakdown of the aggregate reform index into nine component parts. Only quality circles and team building, and computer integrated management are separately significant at the 5% level. With none of the other separate reforms significant at the 5% level, it appears that their introduction is at least benign in terms of productivity growth, that is, their introduction had not resulted in changes to workplace practices that hindered productivity growth.

For the panel workplaces, while both reform indices from 1995 and 1990 are positive, neither is significant at the 5% level. Perhaps surprisingly, for this set of workplaces, the positive lasting influence of the 1990 set of reforms (significant at the 10% level) appears stronger than for the more recent 1995 reforms.

4.4 Training

For the main survey, whether, in the last year, the organization provided any formal program of instruction for employees that was designed to develop their skills was positively associated with higher reported productivity growth. This is in line with Figure 1, where human capital investment was seen as a likely cause of higher productivity growth. This result parallels that of Laplagne and Bensted (1999) and Loundes (1999) who found a strong association between both training and innovation (referred to as organisational and technological changes in this study) and productivity growth. Laplagne and Bensted (1999) also introduce an interaction variable between training and innovation to test whether training and innovation implemented together in a workplace may increase labour productivity more than if introduced by themselves. Their results suggest that training is of benefit to labour productivity growth, but only when implemented in combination with innovation. However, the present study maintains statistically significant independent roles for training, organisational changes

and workplace reforms, with the latter measured in index form. In the current specification, training, with a marginal value of 5%, is about half as important as work restructuring, and roughly on a par with benchmarking or major changes to management or other workplace structures in improving labour productivity growth.

In the panel, training undertaken in the previous year is not shown as an important determinant of productivity growth over the last two years. The positive association between the reform index for the 1990 survey and the 1994-95 productivity growth, may have embodied some element of training since many of the reform processes such as quality circles, computer integrated management and so on, would have required some element of training to be successfully implemented.

4.5 Economic Incentives

For both the main and panel survey, there is little evidence of strong positive influences of performance related pay, profit sharing schemes or share ownership on growth in labour productivity, although, in the panel, the percentage involved in a profit sharing scheme was positive and significant at the 5% level. For the average workplace, however, only about 1.5% of employees were involved in such a scheme. Although about 15% of employees were involved in some type of performance related pay, and about 5% actually owned shares, this appeared to have little influence on productivity growth. This result is not in line with overseas studies, where profit sharing and employee share ownership schemes have been associated with higher productivity, through enhanced long-term commitment, peer monitoring, the incentive to improve efficiency through greater effort, and a desire by employees to be better informed on the progress of the enterprise (Kruse,1992;Black and Lynch,1997;Wadhwani and Wall,1990;Ohkusa and Ohtake,1997;Cahuc and Dormont,1997;Shephard,1994;Cable and Wilson,1990;Pendelton, Wilson and Wright,1998).

4.6 Industrial Relations Environment

For the main survey, in the current study the only industrial relations variable which appears to exert any influence is the union activity variable (significant at the 10% level). Being positive perhaps suggests some weak support for the Freeman and Medoff (1979,1984) 'exit-voice' model over the more traditionally accepted negative 'monopoly' influence of unions on productivity as identified in previous studies (Crockett et al for Australia,1992, Metcalf,1990 for the UK). It needs to be remembered, however, that many of the previous studies, such as the Crockett et al study of the 1990 AWIRS, modelled relative labour productivity, not labour productivity growth as in the current study. Nevertheless, it is not unreasonable to make some linkage between studies of the levels of productivity and the growth of productivity, since higher rates of growth inevitably lead to higher levels of productivity.

While Loundes (1999) found a positive and significant influence of union density on productivity growth using the same data, this was not repeated in this study. This possibly results from the different samples used; Loundes

based her models on 1010 workplaces, those who were identified as formally measuring labour productivity, while this study, along with the Laplagne and Bensted (1999), study used the full range of responses to the productivity question, resulting in around 1700 observations. Unfortunately, it is not uncommon in using large, complicated data sets such as the AWIRS, to find significance levels of particular variable parameters sensitive to sample sizes, and the set of explanatory variables chosen.

The availability of the panel allows a test of whether the change in union density between 1990 and 1995 exerted any influence on assessed productivity growth towards the end of this period. As already identified, union density declined on average about 9% over this period. However, the empirical results suggest this decline had no independent influence on labour productivity growth. This is largely in line with the international comparisons provided by Blanchflower and Machin (1996), where they found no significant association between unions and productivity for the Australian case.

For both the main and panel, there appears to be no support for any of the measures associated with enterprise bargaining on the growth of productivity. This remains true for variables constructed from the responses to questions from the 1995 survey, and for any longer-term influences from variables constructed from the responses to questions from the 1990 survey. While Hawke and Drago (1998) found support for the proposition that employee involvement in negotiating an agreement was positively associated with perceptions of labour productivity growth, this was not paralleled in the current study.

Overall, the current study found little evidence that enterprise bargaining in its widest sense had much influence on labour productivity growth over the period in question. Although Hawke and Drago (1998) conclude that their estimates indicate that workplaces with written agreements were significantly less likely to experience increases in labour productivity than those workplaces without these agreements, this conclusion appears to have come from cross-tabulations of the existence of formal written agreements with various performance measures, including labour productivity. When considered in the framework of the ordered probit models, where other influences can be controlled for, little independent influence appears to remain for the existence of formal written agreements. While the relevant variables reported in this study encompassed both written and verbal agreements, experiments with written agreements alone, resulted in no change to the broad conclusions.

It is perhaps not surprising that little influence of agreement making was found on productivity growth in 1994-95. Firstly, only information on agreements made since 1994 were reported, resulting in only a short period in which to affect productivity levels, and secondly, this was still early days in the shift in the industrial relations climate which supported the movement away from the traditional award structure to the introduction of enterprise agreements.

4.7 Downsizing

For the main survey, the simple dummy variable identifying those workplaces which reported deliberately reducing their employee levels in the last year, for reasons other than reduced demand for the workplace's product or service, was shown to be significant at the 5% level, and positive. The empirical results then suggest that there is an association between workplaces which deliberately downsized in the last year, and the assessed productivity growth over the last two years. Although it is generally difficult to attribute direct causal relationships rather than just an association between variables in cross-sectional models using data such as the AWIRS, in this case, the set of responses provided as reasons for downsizing (particularly as a response to technological change, organisational restructuring, decreased costs or increased efficiency) all suggest changes designed to improve productivity levels.

The study by Dawkins et al (p113) on restructuring and downsizing in Australia, however, found that while their survey of Australian enterprises found that over 80% considered that they had achieved some increase in labour productivity as a result of downsizing, about half of which said they had achieved it to a great extent, that their empirical analysis of the IBIS large firm data base, failed to find any clear evidence of downsizing leading to improved rates of profit. While it seems reasonable to assume a close relationship between higher labour productivity growth and higher profits, the latter is known to be influenced by many other factors such as the assets of the company, market share, capital intensity, change in revenue and the firm's concentration ratio (Dawkins et al.,p109). Further difficulties lie in trying to compare the results of the current study which concerns productivity growth at the workplace level, with the Dawkins et al study which considered the whole enterprise level, and was more concerned at modelling profit levels than productivity levels.

Neither of the variables constructed by looking at the employment growth of the workplace over the last year, identifying downsizers as those which reduced employee numbers by 10% or more, and upsizers as those which increased employee numbers by 10% or more, were shown to be significantly associated with variations in assessed labour productivity growth. Experiments with altering the cut-off percentage to 5% and then to 0% (ie using a dummy variable equal to one if the firm reported a reduced workforce between August 1995 and one year earlier, and zero otherwise) did not alter this result.

While it might have been expected that the downsizing variable identified by reducing employee numbers by 10% or more would line up well with the dummy downsizing variable identifying workplaces which deliberately reduced their employee numbers, there was in fact less than a 50% overlap. This reveals that many workplaces actually reduced their employee numbers over the last year, but did not consider that they had deliberately done so (in fact, 414 or about 23.4% of workplaces actually identified by using the Workplace

Characteristics Questionnaire as having fewer employees in 1995 than a year earlier, did not identify their workplaces as having deliberately reduced their employee numbers). Hence, a reasonable level of downsizing per se (taken here as 10% or more), was shown not to be associated with higher growth of labour productivity, but employee reductions identified as deliberate were shown to be positively associated with higher assessed productivity growth. [6]

The panel allowed the construction of longer-term downsizing and upsizing variables. Given the large divergences in workplace employment growth or decline identified previously, it is probably not surprising that no significant relationship could be identified. It is interesting to note, that although there were substantial declines in employee numbers across a large proportion of workplaces (60.4% were identified as downsized workplaces on the definition used in the study), at least this longer-term downsizing in Australian workplaces appeared benign. As reported by Dawkins et al (1999), the early restructuring successes in New Zealand appear to have turned into declining labour productivities, with labour productivity rates increasing during the late 1980s but declining through the 1990s (p117).

The panel was also able to identify changes in the composition of each workplace's employees, firstly in terms of permanent versus casual, and secondly in terms of full-time versus part-time. The results show that neither the point percentage change in casual versus permanent workers nor the point percentage change in full-time versus part-time workers had any significant independent influence on assessed productivity growth. It may well be that employers are being more influenced in changing the mix of workers by more direct industrial relations issues such as changes to unfair dismissal laws, or changes to superannuation requirements and so, which might be expected to show up more directly in profitability levels than more indirectly via productivity effects.

4.8 Competitive Environment

For the main survey, as reported in similar studies, both an expanding demand for the workplace's product or service, and operating at above full capacity were associated with higher labour productivity growth, with the former reporting a marginal value of 7.2% in relation to the highest productivity rank, and the latter nearly 9%. For the panel, although expanding demand was not significant at conventional levels, operating at full capacity was, contributing to a marginal effect of about 10%.

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[6] A further compounding issue, is that, even though the question relating to intentionally reducing employee numbers was in the 1995 Employee Relations Management Questionnaire, while the question relating to perceived labour productivity growth was in the 1995 General Management Questionnaire, in nearly 60% of workplaces, the respondent to the two questionnaires was the same. It could be argued that, for the individual reporting higher levels of productivity growth, this may have been used, by the same individual, as a justification for the intentional downsizing, thereby biasing the productivity growth response. On the other hand, the order in which the two questionnaires were administered, and the time that elapsed between responses to the two separate questionnaires, would be elements reducing the probability of potential bias.

Perhaps surprisingly, none of the variables measuring competitive pressure in both the main and the panel were significant at conventional levels. This result was in line with the findings of Nunes et al (1993) that higher competitive pressure had little effect on increasing innovation in the Australian workplaces comprising the 1989/90 AWIRS; similarly, Blanchflower and Machin (1996) find little evidence of an association between higher levels of competition and higher levels of productivity growth for both the 1989/90 AWIRS and the British WIRS3. On the other hand, Nickell (1996) does find that increased competition as measured by increased numbers of competitors or by lower levels of rents, was associated with a significantly higher rate of total factor productivity for 670 UK companies. Neither was the variable identifying whether the workplace's product or service was involved in the domestic market only, rather than in predominately export markets or with import competition, significantly associated with higher productivity growth. Being in the private versus non-private sector was also not identified as a significant determinant of assessed productivity growth. However, the ambiguity in the reported literature surrounding competitive influences would suggest caution in concluding that competitive pressure may not be an important influence on productivity growth. It may be, for example, that the relatively large range of explanatory variables in each of the models, leaves some of the influence of these variables on the workplace environment captured by other explanatory variables, lowering the individual levels of significance of the competitive environment variables.

4.9 Control Variables

For both the main and panel surveys, neither workplace size nor age were identified as important influences on productivity growth. Of the variables intending to represent levels of workplace autonomy, whether the workplace was also the head office in Australia was not seen as important. However, whether the workplace belonged to a multinational corporation, was associated with significantly higher productivity growth, possibly reflecting access to a wider and newer range of technologies and ideas, with a marginal value of around 6%, the same order of magnitude as the reporting of major new office technology or major new plant or equipment having been introduced in the last two years.

Along with other similar studies, a perceived high level of management-employee relationship was identified as a significant positive association with higher productivity growth. For the main survey, the marginal effect was about 5.6%. For the panel, the marginal effect for the assessed level at the time of the 1995 survey was also around 5%; however, there was a significant carry-over effect from five years earlier, with a relatively high marginal effect of around 3.6%. This was one of the few variables identified in the panel which appeared to have some lasting effect on productivity growth.

5. Conclusions

In this study, a range of fundamental influences, underlying factors and immediate causes of productivity improvement as conceptualised in Figure 1, were empirically tested using the various questionnaires that make up the AWIRS. Amongst the immediate causes, technological change, including the accumulation of physical capital, and a variety of organisational change variables were shown to strongly influence increased labour productivity growth. Benchmarking, and the combined effect of innovations in the workplace (quality circles, total quality management and so on) were also shown to positively influence labour productivity growth. Since all these are influences requiring deliberate management initiatives, the study confirms that good management practices are essential to productivity growth.

Also amongst immediate causes, the development and accumulation of human capital was identified as an important positive influence. The training variable, though obviously quite inadequate to capture the importance of the development of employee skills, was nevertheless shown to be positive and significant. An independent role was identified for each of training, workplace innovations and reforms, and organisational restructuring, although in practice, it is not difficult to see that each of these categories is not independent of the others. There is little to be gained, for example, in introducing new office technology if workers are not given the skills to implement that new technology.

Economic incentives in the form of performance related pay, share ownership and profit-sharing schemes were not identified as important elements in improving productivity growth. The percentage of employees covered by some component of performance related pay was, however, positive and close to significant at the 10% level, while the significance levels of the other two methods was very low. Such economic incentives, therefore, were, at worst, identified as benign in their effect on productivity growth.

In the group of fundamental influences, the role of institutions was studied mainly in terms of the influence of enterprise bargaining and the role of the union movement. Since the early 1990s, there has been a substantial concentration on the spread of workplace agreements as a major part of the both the federal government and state government's labour market reforms (Hawke and Wooden,1998). Australia's productivity performance was very poor by international standards in the two decades leading up to the 1990s, and the rigidity of the award system was seen as one of the main impediments to increasing the efficiency of the Australian labour market. With no history of enterprise bargaining, however, and hence no empirical evidence on which to base policy, the strong encouragement by various governments to embark on a wholesale dismantling of the award system, has been largely an act of faith.

The current study, as with the Hawke and Drago (1998) study, finds no support for the spread of enterprise bargaining positively affecting labour productivity growth. While Hawke and Drago (1998) did identify some positive role for agreements when what they contained had involved inputs of various kinds from employees, this result was not replicated in the current study. When considering the panel data, which allowed for longer-term influences, the current study also did not find that the coverage of written agreements negatively influenced labour productivity, as reported by Hawke and Drago (1998). At worst, the current study of the panel suggests that the coverage of agreements is benign in terms of the effects on assessed labour productivity growth. Echoing Hawke and Drago (1998), however, that since the analysis primarily concerned the period between 1989 and 1995, when enterprise agreements were still in their infancy, it may not be surprising that productivity and other performance benefits were not apparent in the data.

For the main survey, in terms of union influences as measured by union density, the current study identified neither significant negative nor significant positive influences on productivity growth over the 1994-95 period. This contrasts with a similar analysis of the 1990 AWIRS, where there appeared to be a significant negative impact of unionisation on labour productivity (Crockett et al., 1992). This latter study, however, was concerned with influences on assessed comparative levels of productivity, rather than on perceived productivity growth over time, that is, within the same workplace. In the panel data, in which the change between 1989 and 1995 in union density within the individual workplace was able to be modelled, this reduction in density was not identified as an important factor in the assessed productivity growth over the 1994-95 period.

The phenomenon of downsizing could be seen as either a fundamental influence or as an immediate cause of productivity improvement. The most extensive study in the Australian environment available is that by Dawkins et al (1999), and this is at the organizational rather than the individual workplace level. Their conclusion, on the issue of productivity growth, is that downsizing in their definition is not associated with positive productivity effects. When downsizing is defined simply as having fewer employees this year rather than last year, the current study also finds no significant relationship with improved productivity growth. However, if confined to workplaces identified as ones where workforce reductions were intentionally undertaken for reasons other than as a direct result of reduced demand, a positive and significant effect on assessed productivity growth was identified. In studies on downsizing then, it appears necessary to know some of the context in which the downsizing has taken place, before any general conclusions can be drawn. Downsizing no doubt occurs at a time when the organization is subject to many other forces and changes, and the simple information that a workplace reports a reduction in employee numbers is likely to provide little general information concerning productivity. Downsizing can be either reactive or proactive; failure or ineffectiveness are not prerequisites, since downsizing may be undertaken when no threat or financial crisis exists al all (Cameron, 1993). Some highly productive and profitable firms downsize to remain competitive, while others,

currently unprofitable or with poor productivity records, downsize in an effort to improve future productivity.

In terms of longer-term downsizing over the period 1989 to 1995, the panel data also reported no significant influence of the various downsizing measures on productivity growth in the latter part of this period. What the panel did identify, was a highly dynamic environment of employment changes across workplaces, with, in some cases, very substantial reductions in employee numbers, while in others, quite substantial increases. Further study needs to be directed towards this phenomenon.

The competitive environment in which the firm operates forms one of the underlying factors in the growth of productivity. The current study was not able to identify any significant positive influence of highly competitive markets on productivity growth. Neither was it able to identify any positive effects of operating in an international environment, in the sense of competing against imports or of selling mainly in a world market. Operating in a market where demand for the product or service is expanding, and operating at high levels of capacity, were associated with higher levels of productivity growth. Some advantage in terms of productivity growth also appeared to be associated with being part of a multi-national corporation.

Overall, this study has given empirical support to many of the hypothesised factors in productivity improvement embodied in Figure 1. What does appear to emerge, is that workplace productivity is linked to a large range of influences, many of which have to be in place for the sum total to provide improvement (Rimmer,1998). Analysis of the panel, also suggests that few influences have long lasting effects. Of the range of variables constructed to describe likely influences on productivity levels at the time of the first AWIRS, very few were seen to have had any influence on assessed labour productivity growth up to five years later. This suggests that, in the absence of persisting with appropriate organisational changes, and with the development and accumulation of both physical and human capital, that a rapid return to poor productivity outcomes would be inevitable.

The period since 1995 has been one of rapid changes in the structure of the Australian and world economies, with the growth in particular of electronic commerce, the increased internationalisation of markets, and further micro- and macro-economic reforms, in particular the spread of enterprise bargaining, all of which could be expected to exert influences on productivity growth. When the data becomes available, this should provide a rich harvest for further analysis of workplace performance.

Appendix 1 Variable Construction and Description

Variable	AWIRS Question *	Description
Organisational Change		
Technological change-95 Main: Mean .565 Stdev .496 Panel: Mean .330 Stdev .471	BF1a, BF1b (main); QF1g (panel)	=1 if introduction of major new office technology, or major new plant or equipment, in last 2 years;=0 otherwise
Technological change-90 Panel: Mean .417 Stdev .493	GE1g	=1 if introduction of major new office technology, or major new plant or equipment, in last 2 years;=0 otherwise
Workplace restructuring-95 Main: Mean .582 Stdev .493	BF1c	=1 if major reorganisation of workplace structure, in last 2 years;=0 otherwise
New management structure-95 Panel: Mean .512 Stdev .500	QF1e	=1 if reorganisation of management structure, in last 2 years;=0 otherwise
New management structure-90 Panel: Mean .395 Stdev .489	EF1e	=1 if reorganisation of management structure, in last 2 years;=0 otherwise
Work restructuring-95 Main: Mean .477 Stdev .500	BF1d	=1 if major changes to how non-managerial workers do their work, in last 2 years;=0 otherwise
Restructure of work-95 Panel: Mean .486 Stdev .500	QF1b	=1 if major restructure of how work is done, in last 2 years, in last 2 years;=0 otherwise
Restructure of work-90 Panel: Mean .459 Stdev .500	GE1b	=1 if major restructure of how work is done, in last 2 years, in last 2 years;=0 otherwise
New product/service-95 Panel: Mean .168 Stdev .374	QF1a	=1 if major change in product or service, in last 2 years;=0 otherwise
New product/service-90 Panel: Mean .180 Stdev .385	GE1a	=1 if major change in product or service, in last 2 years;=0 otherwise
More commercial-95 Panel: Mean .289 Stdev .454	QF1d	=1 if change to more commercial orientation, in last 2 years;=0 otherwise
More commercial-90 Panel: Mean .267 Stdev .443	GE1c	=1 if change to more commercial orientation, in last 2 years;=0 otherwise
Change senior management-95 Panel: Mean .459 Stdev .500	QF1f	=1 if change in senior management, in last 2 years;=0 otherwise
Change senior management-90 Panel: Mean .432 Stdev .500	GE1f	=1 if change in senior management, in last 2 years;=0 otherwise
Benchmarking-95 Main: Mean .704 Stdev .456	BD5	=1 if benchmarked against other workplaces;=0 otherwise

Variable	AWIRS Question *	Description
Workplace Reforms		
Reform Index-95 Main: Mean 1.886 Stdev 1.330	CA16a-j	See text under 'Workplace Reforms'; index 0 to 4;reforms introduced in last two years
Reform Index-95 Panel: Mean 2.619 Stdev 1.174 **Reform Index-90** Panel: Mean 1.991 Stdev 1.218	RA17a-j EA31a-k	See text under 'Workplace Reforms'; index 0 to 4;reforms currently in place See text under 'Workplace Reforms'; index 0 to 4;reforms introduced over last 5 years
Formal training-95 Main: Mean ..407 Stdev .491	CA17a	=1 if formal training introduced in last 2years;=0 otherwise
Semi-autonomous groups-95 Main: Mean .209 Stdev .407	CA17a	=1 if Semi-autonomous groups introduced in last 2years;=0 otherwise
Incentive-bonus scheme-95 Main: Mean .252 Stdev .434	CA17a	=1 if Incentive-bonus introduced in last 2years;=0 otherwise
Quality circles/team building-95 Main: Mean .454 Stdev .498	CA17a	=1 if Quality circles/team building introduced in last 2years;=0 otherwise
Staff appraisal-95 Main: Mean .431 Stdev .495	CA17a	=1 if Staff appraisal introduced in last 2years;=0 otherwise
TQM-95 Main: Mean .332 Stdev .471	CA17a	=1 if Total Quality Management introduced in last 2years;=0 otherwise
CIM-95 Main: Mean .131 Stdev .337	CA17a	=1 if Computer Integrated Management introduced in last 2years;=0 otherwise
Skills audit-95 Main: Mean .268 Stdev .443	CA17a	=1 if Skills audit introduced in last 2years;=0 otherwise
JIT-95 Main: Mean .066 Stdev .248	CA17a	=1 if Just in Time introduced in last 2years;=0 otherwise
Training		
Training-95 Main: Mean .747 Stdev .435	CC4 (main); RC4 (panel)	=1 if formal training program in last 2 years;0=otherwise

Variable	AWIRS Question *	Description
Economic Incentives		
Percent performance pay-95 Main: Mean .15.22 Stdev 31.08 Panel: Mean .12.11 Stdev 27.19	CM3 (main); RJ8 (panel)	% non-managerial employees actually receiving performance related pay in the last year; recoded to mid-points – 1=0%;2=5%;3=17%;4=38%; 5=63%;6=87%;7=100%
Profit-share scheme-95 Main: Mean ..056 Stdev .231	CM2d	=1 if profit share scheme;=0 otherwise
Percent profit-share –95 Panel: Mean 1.47 Stdev 10.10	RJ11	% non-managerial employees receiving a payment from a profit sharing scheme, in the last year; recoded to mid-points – 1=0%;2=5%;3=17%;4=38%; 5=63%;6=87%;7=100%
Percent share ownership-95 Main: Mean 5.92 Stdev 18.53 Panel: Mean 8.74 Stdev 23.41	CM6 (main); RJ14 (panel)	% non-managerial employees actually own shares in share scheme in the last year; recoded to mid-points – 1=0%;2=5%;3=17%;4=38%; 5=63%;6=87%;7=100%
Industrial Relations Environment		
Union density-95 Main: Mean 48.49 Stdev 33.36	F40	AWIRS derived variable;% of workplace unionised
Change in union density-90 to 95 Panel: Mean –9.27Stdev 24.04	F40 & N40	Difference in AWIRS derived variables; point % change in union density
Union active-95 Main: Mean .288 Stdev .453 **Union active-90** Panel: Mean .405 Stdev .491	F27B (main); V28B (panel) N27	AWIRS derived variable;=1 if union judged active in workplace;=0 otherwise AWIRS derived variable;=1 if union judged active in workplace;=0 otherwise
Percent verbal/written agreement-95 Main: Mean 39.13 Stdev 41.82	CF5 & CF8	% of non-managerial employees covered by either a verbal or written agreement
Employee involvement in agreement-95 Main: Mean .326 Stdev .469	CFd,e,f,l,m,n; CF41a,b,c,d,e,f	=1 if any one of various measures of employee involvement in agreement, as contained in the list of variables;=0 otherwise
Nogotiation-90 Panel: Mean .522 Stdev .500	EL1	=1 if, in the last year, management negotiated with union delegates from largest union over any workplace matter;=0 otherwise
Bargaining-90 Panel: Mean .503 Stdev .500	N26	AWIRS derived variable; =1 if, in the last year, management bargained with union delegates from largest union over any workplace matter (not union officials);=0 otherwise

Variable	AWIRS Question *	Description
Downsizing		
Downsize-95 Main: Mean .252 Stdev .434	CE1 & CE3	=1 if management intentionally reduced the size of the workforce in the last year, other than for lack of demand;=0 otherwise
Dsize-95 Main: Mean .261 Stdev .439	A1 & A5	=1 if workplace reduced employee numbers by 10% or more in the last year;=0 if employment stable or increasing
Upsize-95 Main: Mean .311 Stdev .463	A1 & A5	=1 if workplace increased employee numbers by 10% or more in the last year;=0 if employment stable or decreasing
Longer-Term Downsizing-90-95 Panel: Mean .605 Stdev .489	P1 & emp (1990 Workplace Characteristics)	=1 if employment growth in workplace for period August 1989 to September 1995 was less than 0%;=0 otherwise
Longer-Term Upsizing-90-95 Panel: Mean .338 Stdev .473	P1 & emp (1990 Workplace Characteristics)	=1 if employment growth in workplace for period August 1989 to September 1995 was greater than 6%;=0 otherwise
Point percentage change permanent -90-95 Panel: Mean .114 Stdev 13.18	P2fpt,P2ppt,P1(95) Ftpt,Ptpt,Emp (90)	Point percentage change in permanent employees at workplace for period August 1989 to September 1995
Point percentage change fulltime-90-95 Panel: Mean –4.41 Stdev 15.55	P2fpt,P2fct,P1 (95) Ftpt,Ftct,Emp (90)	Point percentage change in fulltime employees at workplace for period August 1989 to September 1995

Variable	AWIRS Question *	Description
Competitive Environment		
Competitive pressure-95 Main: Mean 2.77 Stdev 2.08 Panel: Mean 3.05 Stdev 2.57 **Competitive pressure-90** Panel: Mean 2.83 Stdev 2.55	BC6 (main); QC5 (panel) GB5 (panel)	Degree of competition;1=limited to 5=Intense Degree of competition;1=limited to 5=Intense
Few competitors-95 Main: Mean .175 Stdev .380 Panel: Mean .162 Stdev .368 **Few competitors-90** Panel: Mean .189 Stdev .392	BC5 (main); QC4 (panel) GB4 (panel)	=1 if few competitors;=0 if many or no competitors =1 if few competitors;=0 if many or no competitors
External-95 Main: Mean .232 Stdev .422	BC3	=1 if market was domestic with some export or primarily export;=0 otherwise
External-95 Panel: Mean .231 Stdev .422	QC3	=1 if market was domestic with import competition or primarily export;=0 otherwise
Multi-national corporation-95 Main: Mean .215 Stdev .411 Panel: Mean .228 Stdev .420	BB9 (main); GB6 (panel)	=1 if ownership status was other than wholly Australian owned;=0 otherwise
Demand expanding-95 Main: Mean .528 Stdev .500 Panel: Mean .497 Stdev .500	BC8 (main); QC7 (panel)	=1 if demand for main product or service expanding;=0 if stable or contracting
Above normal capacity-95 Main: Mean .237 Stdev .425	BD2	=1 if currently operating above normal capacity;=0 otherwise
Full capacity-95 Panel: Mean .393 Stdev .489	QD2	=1 if currently operating at full capacity;=0 otherwise

Variable	AWIRS Question *	Description
Control variables		
Head office-95 Main: Mean .231 Stdev .421 Panel: Mean .207 Stdev .405	BB19 (main); QB8 (panel)	=1 if workplace is the head office in Australia;=0 otherwise
Management-employee relations-95 Main: Mean 4.23 Stdev .696 Panel: Mean 4.67 Stdev 1.091	BE4 (main); QE5 (panel)	Scale from 1=very poor to 5=very good
Workplace size-95 Main: Mean 2.08 Stdev 4.11	A1	Scaled number of employees in workplace (A1/100)
Workplace age-95 Main: Mean 8.73 Stdev 1.03	BB7	Recode length of undertaking of main activity (BB7) into midpoints of ranges: (1=1.5 years)(2=3.5 years)(3=7.5 years)(4=15 years)(5=35 years)(6=70 years)
Workplace age-95 Panel: Mean 8.74 Stdev 1.03	GA3	Recode length of undertaking of main activity in 1989 (GA3) into midpoints of ranges: (1=1.5 years)(2=3.5 years)(3=7.5 years)(4=15 years)(5=35 years)(6=70 years), and add 6 years.
Private sector-95 Main: Mean .569 Stdev .495 Panel: Mean .617 Stdev .486	BA5 (main); QA13 (panel)	=1 if private sector organization;=0 otherwise

Question numbers beginning with

- A come from the 1995 Main Workplace Characteristics Questionnaire;
- B from the 1995 Main General Manager Questionnaire;
- C from the 1995 Main Employee Relations Manager Questionnaire;
- Q from the 1995 Panel General Manager Questionnaire;
- R from the 1995 Panel Employee Relations Manager Questionnaire;
- G from the 1990 General Manager Questionnaire;
- E from the 1990 Employee Relations Manager Questionnaire;
- F from the set of derived variables from the Main 1995 Questionnaires;
- V from the set of derived variables from the Panel1995 Questionnaires.

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