

# Product Market Competition Wages and Productivity: International Evidence from Establishment-Level Data

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**ABSTRACT.** – That greater product market competition has the potential to affect outcomes in labour and product markets is borne out by one of the key premises of standard economic theory which predicts that, all other things held constant, prices should be lower and efficiency enhanced by more competition. In this paper we test this notion by considering the relationship between product market competition and establishment-level wages and economic performance. We use two microeconomic data sources from Britain and Australia to consider this relationship.

Our results find only a limited role for market competition to impact on wages and productivity. In British workplaces, labour productivity is not raised by more competition, whilst in Australia we can only find evidence of the conventionally expected positive impact in manufacturing workplaces. With respect to wages, the results are more consistent with the competition hypothesis, though effects are not that strong, with significant effects only being found for some of the skill groups within our samples of establishments. Hence, there is only limited support for the key hypothesis of interest that we consider.

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## Concurrence des marchés, salaires et productivité : Une étude sur des données d'entreprises

**RÉSUMÉ.** – Une plus grande concurrence sur le marché des biens peut affecter les résultats observés sur le marché du travail et des biens, tel est le message de la Théorie économique standard qui prédit que, toutes choses égales par ailleurs, les prix devraient être plus bas et l'efficacité accrue par plus de concurrence. Dans ce papier, nous testons cette notion en considérant la relation entre la concurrence sur les marchés des biens, les salaires et la réussite économique. Pour cela, nous utilisons deux échantillons d'entreprises, un de Grande-Bretagne, l'autre d'Australie. Nos résultats montrent que la concurrence sur les marchés a un impact limité sur les salaires et la productivité. Dans les entreprises anglaises, la productivité du travail n'augmente pas sous l'effet de la concurrence, tandis qu'en Australie, cet impact attendu s'observe uniquement dans les industries manufacturières. En ce qui concerne les salaires, les résultats sont plus compatibles avec l'hypothèse sur la concurrence, même si les effets ne sont pas forts, on trouve quelques effets significatifs pour quelques qualifications à l'intérieur de nos échantillons d'établissements. De ce fait, nos résultats n'apportent qu'un soutien modéré à l'hypothèse considérée.

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# 1 Introduction

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That greater product market competition has the potential to affect outcomes in labour and product markets is borne out by one of the key premises of standard economic theory which predicts that, all other things held constant, prices should be lower and efficiency enhanced by more competition. In terms of individual workplaces, one should, *ceteris paribus*, see wages being lower in more competitive situations and performance outcomes (like productivity and efficiency) being improved. In this paper we take this basic prediction and empirically evaluate its importance using establishment-level data from Britain and Australia in the late 1980s and early 1990s.

We focus on two outcome variables of interest, wages and productivity, to assess the competition hypothesis. At the outset, it is worth pointing out that we analyse the relationship between these outcomes and market competition at a disaggregated level (the workplace) and that one needs to be careful what is meant by competition at this level. We utilise unique survey data from the questioning of managers to define our competition variable and we argue that this provides valuable information for several reasons, not least the fact that these managers are allowed to define the market in which they operate and compete, so that (potentially severe) problems of market definition do not contaminate our analysis.

Whilst the separate study of market forces on wages and productivity is not new, there are several features of our analysis that we feel should be stressed. First, as mentioned above, we carry out an international comparison based on studying comparable microeconomic data in Britain and Australia. Second, we consider the impact of competition on both wages and productivity at establishment-level. Third, unlike most studies (of which we are aware) we can consider the relationship between productivity and competition outside the manufacturing sector: our data based on survey questioning of managers is especially useful in this regard.

Our results find only a limited role for market competition to impact on wages and productivity. In British workplaces, labour productivity is not raised by more competition, whilst in Australia we can only find evidence of the conventionally expected positive impact in manufacturing workplaces. With respect to wages, the results are more consistent with the competition hypothesis, though effects are not that strong, with significant effects only being found for some of the skill groups within the samples of establishments that we consider. Hence, there is some limited, but by no means overwhelming, support for the key hypothesis of interest that we consider.

The rest of the paper is structured as follows. In the next section we present some background information on what economic theory has to say about the relationship between product market competition, productivity and wages. Section 3 then presents a description of the data that we use. Section 4 first considers the relationship between establishment-

level productivity and competition, and then moves on to analyse the wage-competition relationship. Finally, section 5 concludes.

## 2 Product Market Competition, Productivity and Wages

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### 2.1. Productivity and Competition

The initial assumption that many have made about the way in which competition affects the productivity performance of workplaces or firms is that it enhances incentives and eliminates various inefficiencies, thereby raising productivity. This can be justified in several ways: in models of managerial incentives where competition raises managerial effort; where the existence of monopoly power enables inefficiencies to be sustained; where competition leads workers to work harder; and others (see the discussion in NICKELL [1993]).

There is, however, currently not much empirical support for this proposition. And what research does exist typically reports fairly weak evidence on the issue. In a study based on industry-level data over time, GEROSKI [1990] reports a negative correlation between innovative activity and industry concentration, and elsewhere (GEROSKI [1991]) reports a positive relation between productivity and the same measure of innovative activity, thus suggesting a positive relationship between productivity and competition. Similar (statistically quite weak) results, also based on industry data, are reported in HASKEK [1992]. And some firm-level evidence of a negative relationship between productivity and market share is presented in NICKELL, WADHWANI and WALL [1992] and NICKELL [1993].

The empirical work that we present below considers the relationship between productivity and competition at establishment-level. We feel that this is the appropriate level of (dis)aggregation for considering this issue. And, we present evidence from comparable establishment data in two countries (Britain and Australia) in the hope of providing a stronger test than that merely based on a single country study as, if one can identify a link between productivity and competition, then presumably one would expect to see similar patterns (e.g. across industries) in different countries.

### 2.2. Wages and Competition

Predictions about the relationship between wages and competition have received more attention and there are numerous models of the labour market (e.g. rent-sharing models, efficiency wage models, effort bargaining models) that predict wages will be higher (lower) in less (more) competitive situations. This is because less competition generates a surplus, to which workers have a claim of a share.

According to the competitive model, an employer is a wage-taker and must set the wage rate which gives workers the market level of utility. In a purely competitive world, the surplus cannot exceed the amount which is just required to compensate the agents for their efforts. There is no scope for bargaining; employers are unable to appropriate any of the returns to an improvement in their firm's prosperity; there are no rents. However, objections to this perfectly competitive view have been voiced for many years.

In an early attack on the traditional analysis, Sumner SLICHTER [1950] argued that a competitive model fails to explain the empirical evidence that apparently homogenous types of employee earn significantly different amounts in different industries. His data, drawn from the US manufacturing sector, showed that wages appeared to be positively correlated with various measures of the employer's "ability to pay". Slichter concluded that this correlation provided *prima facie* evidence against a conventional competitive model.

Early UK work by MACKAY *et al.* [1971] echoed such sentiments. After examining the personnel records of 75,000 manual workers in 66 engineering plants, the authors were led to reject the validity of the competitive model. They found substantial, persistent wage differentials which could not be explained satisfactorily by non-pecuniary factors.

Recent research into this issue in the US by Dickens and KATZ [1987], KRUEGER and SUMMERS [1987, 1988], KATZ and SUMMERS [1989], ALLEN [1994] and BLANCHFLOWER, OSWALD and SANFEY [1994] has reached the same conclusions using better data than were available in Slichter's time. These studies show that there are unexplained industry wage differentials and, in some cases, examine the correlation between wage levels and industry profitability. ABOWD and LEMIEUX [1993] and CHRISTOFIDES and OSWALD [1992] also find effects from profitability on wages, after controlling for fixed effects, using union contract data for Canada.

Related work, often with panel data, has been done on European labor markets. This includes research by, for example, ABOWD and ALLAIN [1994], ABOWD, KRAMARZ and MARGOLIS [1994], BECKERMAN and JENKINSON [1990], CARRUTH and OSWALD [1989], HOLMLUND and ZETTERBERG [1991], DENNY and MACHIN [1991], HILDRETH and OSWALD [1992] and NICKELL and WADHWANI [1990]. All find evidence for some kind of ability-to-pay effect on wages. In BLANCHFLOWER, OSWALD and GARRET [1990], data from the Workplace Industrial Relations Survey of 1984 (WIRS2) was used to examine the forces that determine wages in Great Britain. Pay appeared to be shaped by both inside and outside forces: an establishment's financial performance and its oligopolistic position influenced pay as did the state of the local labor market as measured by the local area unemployment rate<sup>1</sup>. Profitable employers appeared to pay significantly more, *ceteris paribus*, than did unprofitable ones. BLANCHFLOWER and OSWALD [1988]

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1. For more on this see BLANCHFLOWER and OSWALD [1994].

also presents questionnaire evidence using data from the same source that is also consistent with this view.

### 3 Data Description

We consider evidence based on data from two (broadly) comparable cross-sectional surveys of establishments in Britain (in 1990) and Australia (mostly in 1990)<sup>2</sup>. Before considering the actual data that we use, it is however worth pointing out that at the times of the surveys both countries were at very similar points in the economic cycle. Figure 1 plots unemployment rates over time in the two countries to illustrate this and shows very similar unemployment rates and very similar points of the business cycle in both countries in 1990. This is important if we are to draw cross-country comparisons from our empirical work and very similar points of the business cycle in both countries in 1990. This is important if we are to draw cross-country comparisons from our empirical work.

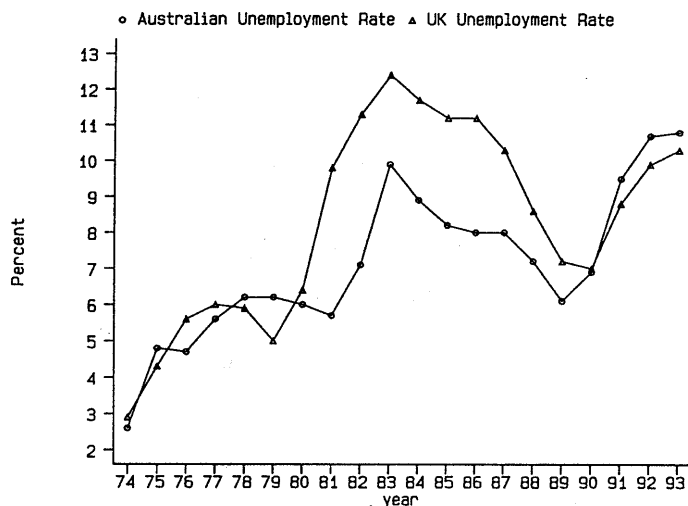


FIGURE 1

*Standardised UK and Australian Unemployment Rates, 1974-1993.*

Source: OECD Economic Outlook, 56, December 1994.

#### 3.1. The British and Australian Workplace Industrial Relations Surveys

To date, there have been three nationally representative surveys of industrial relations issues in British workplaces with at least 25 employees

2. The AWIRS survey was mostly conducted in 1990, with interviews taking place in the period from November 1989 to May 1990.

which were conducted in 1980, 1984 and 1990 (more details are in MILLWARD *et al.* [1992]). The surveys have been used quite extensively by industrial relations researchers and by labour economists to analyse a range of issues (see MILLWARD [1992], for a description of this research). They are very rich in terms of information on industrial relations issues, but also contain various questions of interest to economists. The 1990 survey that we use here (WIRS3) contains information on 2061 workplaces.

The Australian Workplace Industrial Relations Survey (AWIRS) contains data on 2004 workplaces with at least 20 employees. It is described in some detail in CALLUS *et al.* [1992]. The differences in sampling arrangements between WIRS3 and AWIRS concern the size cut-off (25 versus 20 employees) and that WIRS3 excludes mining establishments. We use comparable samples by excluding Australian mining workplaces and those with less than 25 workers. Some of the questions asked in AWIRS are directly comparable with those from the British surveys, though there are, in some cases, different wordings and different questions asked. Our work attempts to ensure comparability of both questions and samples used in our empirical work below. Fuller details on sampling frames and the overall nature of both surveys are given in the Data Appendix.

### 3.2. Basic Data Description

In terms of the data we consider, WIRS3 and AWIRS asked comparable questions on establishment-level productivity performance, and on the extent of competition faced by the establishment. The precise questions asked to the principal management respondent in both-surveys were:

- **Labour Productivity**

*“In your opinion how does the level of labour productivity here compare with other similar workplaces*

*A lot higher*

*A little higher*

*About the same*

*A little lower*

*A lot lower”*

- **Competition**

*“Is the market dominated by your organisation, are there only a few competitors or are there many competitors (Few equals five or a lower number)*

*Organisation dominates market*

*Few competitors*

*Many competitors”*

In Table 1 we report some descriptive data on the market competition variable. The distribution displays a similar pattern across countries, with just over 60 percent of respondents stating that they faced five or more competitors across all sectors, and around 50 percent in manufacturing. Table A1 in the Appendix gives a more detailed industry breakdown and

TABLE 1

*Product Market Competition Measures*

	British WIRS		Australian WIRS	
	All	Manufacturing	All	Manufacturing
No Competitors	.086	.056	.039	.015
Few Competitors	.304	.403	.309	.450
Many Competitors	.611	.541	.652	.535
Number of Establishments (Unweighted)	1,223	544	1,125	355
Estimated Coefficient From Logit Regression of Many Competitors Dummy Variable on Industry Concentration (standard error)	–	– .840 (.427)	–	– 1.461 (.840)

<sup>1</sup> All refers to all private sector plus commercial public sector establishments.

<sup>2</sup> Australian data excludes mining and establishments with less than 25 employees to ensure comparability.

<sup>3</sup> The industry concentration data are the 3-digit industry 5-firm concentration ratio for Britain and the 2-digit 4-firm concentration ratio for Australia.

<sup>4</sup> Proportions are weighted using survey weights.

shows a very similar cross-country distribution of the extent of product market competition. As such it seems that more competitive industries are likely to be the same ones in each country (a simple correlation coefficient for the one-digit industries in the Table=.798).

As the competition variable is an unconventional one, it is worth discussing its relative advantages and disadvantages as compared to the more orthodox ones that are often utilised by economists (e.g. firm market share or industrial concentration). The first point to note is that a considerable problem with the latter is that they are usually based on a rigid definition of the market corresponding to some kind of industrial classification (e.g. 3-digit industry). This can be very problematic for a number of reasons, including the fact that firms are often diversified and may well compete across several industries and that different levels of disaggregation may delineate markets for different firms. A key advantage of our measure is that it lets managers define their own market. A second advantage is that, despite the subjective nature of the questioning, the variable does actually reflect what managers think and, as such, provides a very useful counterpoint to more frequently utilised measures of competition. A third advantage is that the variable applies equally well outside of the manufacturing sector, and, as very little is known about competitive pressures (and their economic effects) in the service sector, this is very useful and we consider differences in manufacturing and non-manufacturing establishments in our empirical work.

Of course, the variable also has its limitations. It provides only qualitative information and one may think the cut-off point of five competitors to be somewhat arbitrary. On the latter it is somewhat reassuring that some work in Industrial Organization (BRESNAHAN and REISS [1991]) finds that five is

an important threshold number in terms of defining market power. It is also reassuring that, as the last row of Table 1 testifies, the measure is correlated with industry concentration measures in manufacturing<sup>3</sup>.

Turning to the relative productivity variable, Table 2 reports the distribution of responses given by British and Australian managers, for all establishments and for manufacturing establishments separately (cross-industry comparisons for both countries are given in Table A2 of the Data Appendix). The reason for reporting statistics for the manufacturing sector is that, as in the case of the competition variable, data on productivity is

TABLE 2

*Relative Productivity Performance and Market Competition*

	All	Many Competitors	No/Few Competitors	Difference
<b>British WIRS – All</b>				
A lot above average . . . . .	.146	.137	.151	– .014
A little above average . . . . .	.325	.362	.303	.059
About average . . . . .	.431	.425	.434	– .009
A little below average . . . . .	.094	.073	.106	– .033
A lot below average . . . . .	.005	.002	.006	– .004
Number of establishments (unweighted) . . . . .	1,084	490	594	
<b>British WIRS – Manufacturing</b>				
A lot above average . . . . .	.108	.100	.118	.018
A little above average . . . . .	.350	.332	.374	– .042
About average . . . . .	.465	.469	.458	.011
A little below average . . . . .	.069	.083	.050	.033
A lot below average . . . . .	.009	.016	.001	.015
Number of establishments (unweighted) . . . . .	484	227	257	
<b>Australian WIRS – All</b>				
A lot above average . . . . .	.103	.106	.097	.009
A little above average . . . . .	.324	.311	.351	– .040
About average . . . . .	.448	.462	.420	.042
A little below average . . . . .	.115	.112	.120	– .008
A lot below average . . . . .	.011	.009	.015	– .006
Number of establishments (unweighted) . . . . .	750	505	245	
<b>Australian WIRS – Manufacturing</b>				
A lot above average . . . . .	.089	.130	.040	.070
A little above average . . . . .	.364	.320	.416	– .096
About average . . . . .	.378	.380	.376	.004
A little below average . . . . .	.155	.164	.144	.020
A lot below average . . . . .	.015	.007	.024	– .017
Number of establishments (unweighted) . . . . .	247	144	123	

<sup>1</sup>. Weighted proportions based on using WIRS weights.

3. Industrial concentration data is only available for manufacturing industries in both countries.



usually only available in manufacturing (see GRILICHES [1992], and GORDON [1992], for discussions of the difficulties involved in measuring productivity in the service sector). Again, before considering the descriptive statistics in the Table it is worth pointing out the relative merits and shortcomings of this variable.

There are notorious difficulties in accurately measuring productivity. For example, the usual measure used in the existing literature is some kind of value added measure which is typically normalised on employment or total employee hours. There are well known difficulties with measuring value added, and associated problems with deflating by some suitable price index to obtain an output measure. Some work has used physical output measures (e.g. studies of the cement industry) but this work then suffers from the shortcoming that such measures are only available for a small number of very specific sectors. The measure that we utilise does not suffer from these problems as it actually asks managers what they think their labour productivity is, and therefore provides a very useful counterpoint to the more conventional measures that have been used in existing work. Of course, it also suffers from the potential problems generated by it being a qualitative index which contains less information than continuous measures.

Turning to the actual statistics in Table 2, one can see a pattern that managers are more likely to report about or above average productivity levels in both surveys. In terms of the overall distribution there is also very little difference between responses in the sub-samples of manufacturing establishments and the full samples.

The last three columns of the Table report the distribution of responses conditional on the competition variable (defined by a dummy variable equal to one for establishments with many competitors and zero for those with few or no competitors). Some noticeable differences emerge. In the British survey, there is little difference between manager's responses across establishments that face many competitors as compared to those which face few or none; this is also the case in the manufacturing sub-sample. On the other hand, there is some difference in the Australian survey, especially in manufacturing.

The second issue of interest in this paper concerns the relationship between wages and competition, so Table 3 reports average weekly pay levels for the various skill groups within the establishment that each survey contains<sup>4</sup>. The pay data in the Table point to the expected pattern across occupational groups in both countries, but also display an interesting pattern when one conditions on the market competition variable. Pay is almost always lower

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4. It is worth pointing out that, unlike the competition and productivity variables, the pay questions are not the same across the two surveys. In the British WIRS they are the median wage of the majority sex worker in the establishment and are available for five skill groups (unskilled, semi-skilled and skilled manual workers, clerical workers and supervisory staff and foremen). In the Australian survey they are available as the minimum, mode and maximum wage for workers in eight skill groups (labourers and unskilled workers, plant and machine operators, sales and personal service workers, clerks, tradespersons, para-professionals, professionals and managers). These wage definitions are discussed more below.

TABLE 3

*Average Weekly Wage Differences Broken Down by Market Competition*

	All	Many Competitors	No/Few Competitors	Difference
British WIRS				
Skilled manuals . . . . .	209.3	202.6	221.4	- 18.8
Semi-skilled manuals . . . . .	160.9	151.1	173.1	- 22.0
Unskilled manuals . . . . .	135.8	133.3	139.4	- 6.1
Clericals . . . . .	154.7	153.7	156.2	- 2.5
Foremen . . . . .	229.7	231.1	227.4	3.7
Australian WIRS				
Labourers and unskilled workers . . .	361.6	351.7	376.1	- 24.4
Plant and machine operators . . . . .	433.0	416.0	456.0	- 40.0
Sales and personal service workers . .	463.5	455.6	456.8	- 1.2
Clerks . . . . .	408.6	391.1	419.7	- 28.6
Tradespersons . . . . .	489.0	478.6	502.8	- 24.2
Para-professionals . . . . .	610.5	620.7	590.8	30.1
Professionals . . . . .	764.4	742.4	735.6	6.8
Managers . . . . .	817.8	782.9	820.0	- 37.1

*Weekly wages are in pounds sterling for WIRS3 and in Australian dollars for AWIRS.*

in establishments that face many competitors, as the pay gap in the final column shows. This is only not the case for foremen/supervisors in Britain and for two of the higher grade non-manual groups in the Australian survey (para-professionals and professionals).

The raw data presented in this section suggests that the distribution of product market power displays a very similar cross-industry pattern in both Britain and Australia. In terms of its relationship with productivity and wages, there is little evidence of much of a link with establishment-level productivity, but wages seem to be lower where there is more competition. In the next section of the paper we subject this to more rigorous testing as we report econometric models of the determinants of productivity and wages at establishment-level.

## 4 Empirical Analysis

### 4.1. Productivity Equations

In Tables 4 and 5 we report Ordered Probit estimates of the determinants of productivity for the two surveys<sup>5</sup>. As far as possible we have tried to

5. The qualitative dependent variable is ordered from 0 to 4, with 0 corresponding to the lowest productivity level and 4 to the highest. Hence, a positive coefficient in the Ordered Probit models means higher productivity.

TABLE 4

*Ordered Probit Estimates of Relative Productivity Equations in Britain*

	All	Manufacturing	Non-Manufacturing
Many competitors . . . . .	.043 (.065)	.011 (.097)	.036 (.089)
Public . . . . .	-.051 (.079)	-.034 (.101)	-.017 (.108)
Union recognition . . . . .	-.056 (.243)	.447 (.760)	1.190 (1.072)
50-99 employees . . . . .	-.333 (.086)	-.443 (.127)	-.446 (.137)
100-199 employees . . . . .	-.164 (.119)	.124 (.216)	.101 (.248)
200-499 employees . . . . .	.065 (.122)	.417 (.218)	.353 (.249)
500-999 employees . . . . .	-.061 (.127)	.215 (.220)	.022 (.252)
1 000 or more employees . . . . .	.177 (.134)	.374 (.235)	.319 (.268)
Age ≥ 2 and < 5 years . . . . .	-.069 (.126)	.061 (.227)	-.074 (.260)
Age ≥ 5 and < 10 years . . . . .	-.342 (.226)	.234 (.406)	.077 (.415)
Age ≥ 10 and < 20 years . . . . .	-.297 (.224)	.334 (.394)	.050 (.406)
Age ≥ 20 years . . . . .	-.321 (.215)	.136 (.386)	.206 (.395)
	-.527 (.207)	-.018 (.370)	.005 (.377)
			-.118 (.102)
			-.115 (.108)
			-.320 (.169)
			-.250 (.258)
			-.254 (.117)
			-.162 (.142)
			.002 (.070)
			.161 (.148)
			.151 (.162)
			.146 (.178)
			.186 (.203)
			.023 (.084)
			.601 (.483)
			.276 (.293)
			.391 (.293)
			.600 (.573)
			.776 (.279)
			.754 (.270)

TABLE 4 (Continued)

	All		Manufacturing		Non-Manufacturing	
	No	Yes(7)	No	Yes(7)	No	Yes(7)
A little below average fperf . . . . .		.414 (.239)	.156 (.315)		.754 (.379)	
About average fperf . . . . .		.792 (.207)	.443 (.276)		1.296 (.322)	
A little above average fperf . . . . .		1.351 (.211)	.892 (.287)		1.977 (.328)	
A lot above average fperf . . . . .		1.601 (.216)	1.244 (.299)		2.139 (.330)	
Industry dummies . . . . .	No	Yes(7)	No	Yes(7)	No	Yes(7)
Log-Likelihood . . . . .	-1,400.04	1,335.24	-626.88	-602.24	-768.50	-607.40
Number of establishments . . . . .	1,084	1,056	484	477	600	512

1. The dependent variable is a categorical indicator of relative productivity ranging from 0 to 4 corresponding to the following categories: 0 - a lot below average; 1 - a little below average; 2 - about the same; 3 - a little above average; 4 - a lot above average.

2. Ordered Probit estimates. Asymptotic standard errors in parentheses.

3. The variable fperf is a qualitative index of financial performance, ranging from well below average to well above average financial performance (the left-out dummy is well below average).

TABLE 5

*Ordered Probit Estimates of Relative Productivity Equations in Australia*

	All			Manufacturing		Non-Manufacturing			
Many competitors . . . . .	.111 (.083)	.062 (.094)	.023 (.116)	.275 (.130)	.296 (.139)	.403 (.168)	-.067 (.112)	-.116 (.134)	-.324 (.175)
Public . . . . .		-.449 (.177)	-.457 (.235)		-.720 (.403)	-.530 (.509)		-.414 (.207)	-.535 (.284)
Union present . . . . .		-.121 (.115)	-.161 (.128)		-.014 (.228)	-.063 (.245)		-.146 (.138)	-.240 (.159)
50-99 employees . . . . .		-.017 (.112)	-.051 (.130)		-.070 (.213)	-.169 (.240)		-.014 (.134)	-.075 (.159)
100-199 employees . . . . .		-.063 (.122)	.114 (.147)		-.084 (.241)	.136 (.277)		-.097 (.144)	.037 (.180)
200-499 employees . . . . .		-.042 (.148)	.045 (.175)		-.137 (.245)	-.185 (.278)		.003 (.209)	.174 (.263)
500-999 employees . . . . .		-.166 (.168)	.004 (.217)		-.427 (.299)	-.651 (.399)		.067 (.226)	.360 (.284)
1 000 or more employees . . . . .		-.375 (.263)	-.336 (.339)		-.288 (.390)	-.379 (.564)		-.306 (.428)	.236 (.516)
Age ≥ 5 and < 10 years . . . . .		-.036 (.181)	-.184 (.215)		.090 (.418)	-.653 (.519)		-.040 (.210)	.049 (.255)
Age ≥ 10 and < 20 years . . . . .		-.026 (.155)	-.065 (.186)		-.013 (.382)	-.480 (.491)		.031 (.176)	.111 (.213)
Age ≥ 20 and < 50 years . . . . .		-.022 (.150)	-.131 (.179)		.060 (.373)	-.457 (.477)		.015 (.170)	.024 (.204)
Age ≥ 50 years . . . . .		-.210 (.166)	-.219 (.200)		-.056 (.394)	-.457 (.502)		-.212 (.193)	-.141 (.232)
Mainly Australian . . . . .		-.153 (.121)	-.156 (.146)		-.020 (.208)	.101 (.245)		-.172 (.153)	-.252 (.188)

TABLE 5 (Continued)

	All		Manufacturing		Non-Manufacturing	
	Yes	No	Yes	No	Yes	No
Foreign . . . . .	.148 (.133)	-.009 (.152)	.247 (.216)	.029 (.253)	.112 (.174)	-.039 (.200)
Mainly Foreign . . . . .	-.198 (.170)	-.311 (.202)	-.127 (.236)	-.357 (.293)	-.144 (.258)	-.332 (.295)
Jointly Owned . . . . .	.018 (.414)	-.163 (.456)			.051 (.424)	-.212 (.471)
Domestic and import . . . . .	.159 (.089)	.078 (.106)	.192 (.147)	.197 (.177)	.127 (.115)	.050 (.141)
Export market . . . . .	.670 (.245)	.955 (.369)	.229 (.320)	.057 (.624)	1.591 (.474)	2.071 (.606)
Rate of return, 0-5% . . . . .		-.094 (.170)		-.094 (.281)		-.248 (.224)
Rate of return, 6-10% . . . . .		.186 (.171)		.262 (.279)		.104 (.226)
Rate of return, 11-15% . . . . .		.102 (.190)		.050 (.306)		.035 (.252)
Rate of return, 15% or more . . . . .		.451 (.172)		.778 (.267)		.126 (.236)
7 Industry dummies . . . . .	No	Yes	No	No	No	Yes
Log-Likelihood . . . . .	-977.10	-944.97	-367.50	-260.69	-601.83	-399.40
Number of establishments . . . . .	750	743	267	201	483	329

1. The dependent variable is a categorical indicator of relative productivity ranging from 0 to 4 corresponding to the following categories: 0 - a lot below average; 1 - a little below average; 2 - about the same; 3 - a little above average; 4 - a lot above average.

2. Ordered Probit estimates. Asymptotic standard errors in parentheses.

estimate comparable specifications in the two countries. For each country we report separate results for the trading sector – we exclude public sector non trading establishments but include those in public sector trading. We then report results separately for manufacturing and non-manufacturing samples.

Starting with Table 4 for Great Britain, in column 1 we include only a constant and a dummy variable set to one if the establishment faces many competitors, and zero otherwise. The estimated coefficient on this variable is insignificantly different from zero: it remains so in column 2 when we add controls for the public sector, whether unions were recognised at the workplace, establishment size, age and industrial sector. Furthermore, the estimated coefficient remains insignificant in column 3 when we add four dummy variables reflecting management's view of the financial performance of the establishment.

Analogous results to those reported in column 1-3 are found for the manufacturing sector in columns 4-6 and non-manufacturing in columns 7-9. Again, no significant competition effects are isolated. However, one interesting result is the finding that unions have a negative effect on productivity in all specifications and all sectors. This runs contrary to the claim for the U.S. in FREEMAN and MEDOFF [1984] that unions have a positive impact on productivity but is consistent with the firm level results for the U.K. of PENCAVEL [1977], EDWARDS [1987] and the industry level results of KNIGHT [1989] and DAVIES and CAVES [1987].

An obvious question that comes to mind is whether there is much variation in the size of the estimated union effects across sectors given the higher level of union recognition in manufacturing compared with services (38 percent and 45 percent in our sample respectively). In part a) of Table 6 we report the weighted mean of the productivity variable plus a series of predicted probabilities based on the level of productivity at the workplace compared with similar workplaces. The method used is called the "method of recycled predictions" in which we vary characteristics of interest across the whole data set and then average the predictions. That is, we have data on both union and non-union workplaces: we will first pretend that all workplaces in the data file are unionized holding their other characteristics constant. We then calculate the probability of each outcome. Next we pretend that all workplaces in the file are non-union, again holding their characteristics constant. We then calculate the probability of each outcome. The difference between the two sets of probabilities, then, is the difference due to union status holding other characteristics constant.

Overall, we found a probability of .40 in union workplaces that productivity was a lot or a little above average compared with .52 for non-union workplaces. Conversely, the probabilities are .15 and .09 respectively that the manager reported that productivity was a lot or a little below average. The differences in the predicted probabilities between union and non-union workplaces were greater in manufacturing than in non-manufacturing: in the former case the probability of reporting that productivity was a lot or a little above average was .39 for union workplaces compared with .57 for non-union workplaces whereas in non-manufacturing the figures were .43 and .51 respectively. Similar stories apply at the lower end for the below average categories also.

TABLE 6

***Predicted Probabilities***

## 1. Britain – Relative Productivity, all Establishments (Column 2, Table 4)

	A Lot Above Average	A Little Above Average	About Average	A Little Below Average	A Lot Below Average
Union . . . . .	.10	.30	.45	.13	.02
Non-Union . . . . .	.17	.35	.39	.08	.01

## 2. Britain – Relative Productivity, Manufacturing Establishments (Column 5, Table 4)

	A Lot Above Average	A Little Above Average	About Average	A Little Below Average	A Lot Below Average
Union . . . . .	.08	.31	.45	.14	.03
Non-Union . . . . .	.17	.40	.36	.07	.01

## 3. Britain – Relative Productivity, Non-Manufacturing Establishments (Column 8, Table 4)

	A Lot Above Average	A Little Above Average	About Average	A Little Below Average	A Lot Below Average
Union . . . . .	.13	.30	.44	.12	.01
Non-Union . . . . .	.18	.33	.40	.09	.01

## 4. Austria – Relative Productivity, Manufacturing Establishments (Column 5, Table 5)

	A Lot Above Average	A Little Above Average	About Average	A Little Below Average	A Lot Below Average
Many Competitors . . . . .	.14	.35	.35	.14	.02
Few/No Competitors . . . . .	.08	.27	.39	.22	.04

## 5. Britain – Three Year Change in Productivity, Non-Manufacturing Establishments

	A Lot Higher	A Little Higher	About The Same	A Little Lower	A Lot Lower
Union . . . . .	.36	.42	.19	.02	.001
Few/No Competitors . . . . .	.28	.43	.25	.04	.002

1. There are “recycled” predicted probabilities and their method of calculation is described in the text of the paper.

Also available in the British survey of 1990 is the following question.

*“In your opinion how does the level of productivity here compare with what it was 3 years ago?”*

*A lot higher?*

*A little higher?*



*About the same?*

*A little lower?*

*A lot lower?"*

The (weighted) responses to this question are reported in Table 7.

TABLE 7

***Productivity Growth by Union Status***

Responses	All Establishments		Manufacturing		Non-Manufacturing	
	Union	Non-Union	Union	Non-Union	Union	Non-Union
A lot higher . . . . .	.33	.30	.22	.33	.39	.29
A little higher . . . . .	.44	.36	.51	.38	.41	.36
About the same . . . . .	.17	.31	.19	.23	.17	.34
A little lower . . . . .	.05	.02	.07	.05	.03	.01
A lot lower . . . . .	.01	.001	.01	–	.01	.001

There is existing evidence for the UK in the 1980s that unions had a positive impact on productivity growth<sup>6</sup>, at least in some years, and Table 7 also shows some tendency for managers in union workplaces to report more favourably on the change in productivity than is true in non-union workplaces. This is especially apparent in non-manufacturing (see also MACHIN and STEWART [1994], who study productivity growth at the end of the 1980s using this variable). In an attempt to explore the issue of whether unions had a negative impact on productivity growth we estimated a series of Ordered Probit equations using these responses as the dependent variable.

Results are reported in Table 8. The union variable is insignificant overall and in manufacturing, but is significant and positive in non-manufacturing. In panel 5 of Table 6 we also report the predicted probabilities derived from the final column of Table 8 for non-manufacturing using the method of recycled predictions outlined above. The predicted probability of reporting that productivity was a lot higher than it had been three years earlier was .36 in union establishments compared with .28 in non-union.

Hence, we have evidence of a negative union effect on productivity, coupled with (in non-manufacturing) some evidence of a relative productivity improvement in the late 1980s. This is consistent with stories that stress productivity improvements as a consequence of a weakened union movement and with other empirical evidence on this issue in the UK (e.g. see GREGG *et al.*'s [1993], evidence that productivity growth was higher in 1988-1989 in unionized firms).

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6. See METCALF [1990] and GREGG *et al.* [1993], among others.

TABLE 8

*Estimated Productivity Growth Equations for Britain*

	All		Manufacturing		Non-Manufacturing	
Many competitors . . .	-.019	-.032	-.006	-.014	.005	-.002
	(.064)	(.069)	(.095)	(.098)	(.089)	(.101)
Public . . . . .		-.284		.223		-.366
		(.179)		(.500)		(.200)
Union recognition . . .	.118	.075	-.094	-.161	.276	.241
	(.065)	(.078)	(.105)	(.121)	(.088)	(.105)
25-49 employees		-.106		-.327		-.140
(1987) . . . . .		(.235)		(.466)		(.278)
50-99 employees		-.239		-.545		-.213
(1987) . . . . .		(.234)		(.464)		(.279)
100-199 employees		.109		-.160		.094
(1987) . . . . .		(.241)		(.470)		(.292)
200-499 employees		-.166		-.292		-.254
(1987) . . . . .		(.243)		(.466)		(.300)
500-999 employees		-.061		-.239		-.029
(1987) . . . . .		(.249)		(.468)		(.320)
1000-1999 employees		-.053		-.177		-.212
(1987) . . . . .		(.250)		(.470)		(.328)
2000 or more employees		.060		-.086		.031
(1987) . . . . .		(.230)		(.454)		(.275)
Age ≥ 2 and < 5 years		-.129		-.092		-.179
		(.222)		(.388)		(.275)
Age ≥ 5 and < 10 years		-.418		-.239		-.494
		(.219)		(.369)		(.273)
Age ≥ 10 and < 20 years		-.357		-.073		-.493
		(.210)		(.360)		(.261)
Age ≥ 20 years . . . . .		-.240		-.060		-.312
		(.203)		(.345)		(.253)
8 Industry dummies . . . . .	No	Yes	No	Yes	No	Yes
Log-Likelihood . . . . .	-1,397.339	-1,331.808	-627.996	-614.612	-760.297	-705.346
Number of establishments . . . . .	1,183	1,150	531	524	652	626

1. The dependent variable is a categorical indicator of relative productivity ranging from 0 to 4 corresponding to the following categories: 0 - a lot below average; 1 - a little below average; 2 - about the same; 3 - a little above average; 4 - a lot above average.

2. Ordered Probit estimates. Asymptotic standard errors in parentheses.

3. Employment is measured three years ago (in 1987), so base category is < 25 workers.

We now turn to Australia. In Table 5 we report a series of Ordered Probit estimates where the dependent variable is the same as used in Table 4 for Great Britain. Once again we report overall results for the traded sector as well as separately by industrial sector, with and without a series of control variables. We find evidence that productivity is higher

where the establishment produces products for export<sup>7</sup>. Given the high levels of unionization itself and of spillovers of agreements across sectors in Australia it is perhaps unsurprising that we find no evidence of any union productivity effects.

As in the case of Great Britain overall the coefficient on the “many competitors” variable is insignificant whether we include a group of control variables or not. There is weak evidence in non-manufacturing that productivity is actually lower where there are many competitors (“t”=1.85). In manufacturing, which accounts for around a third of our sample, we find evidence that the coefficient on this variable is significantly positive (“t”=2.40 in column 3). How big are the effects? The predicted probabilities calculated in the same way as above are reported in panel 4 of Table 6. The predicted probability of reporting that productivity was a lot or a little above average compared with similar workplaces was .49 in competitive workplaces compared with .35 in non-competitive ones.

In both Australia and Great Britain we do find some evidence that relative productivity is higher where profits are higher. We do have to use somewhat different variables in the two countries. In Britain respondents were asked to report on how the financial performance at their workplace compared with similar workplaces – the excluded category was “a lot below average”. Productivity appeared to improve with financial performance. In Australia we used a variable which showed the rate of return on capital for approximately two thirds of our sample. Productivity was especially high in workplaces that had rates of return of 15 percent and more. Despite obvious worries about the endogeneity of this variable, this is potentially another way of picking up non-competitive behaviour and does suggest that more profitable establishments have higher productivity levels. Of course, however, this may be due to factors other than competitive pressures so one should probably not read too much into this result.

## 4.2. Wage Equations

Data in both WIRS3 and AWIRS are available on wages. As already noted above (in footnote 4) the questions asked are rather different across the surveys. In the British case the question was asked separately for five groups of workers – unskilled, semi-skilled and skilled manuals, clericals and supervisors. Responses are available for a category of worker only if there are at least five workers of that type at the workplace. First, respondents were asked to report whether the majority group in the category were men or women: then they were asked “If all the employees were listed individually in order of their gross weekly earnings (including any bonuses or overtime) which of the ranges on this card would apply to the

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7. This positive export performance effect in the Australian equations is particularly pronounced in non-manufacturing. In the British survey, based on a much smaller sample of around 350 establishments from the financial manager’s questionnaire, we also considered a variable based on whether the main market for the establishment’s products or services was primarily export but could find no significant effect on productivity.

employee in the middle of such a list?" Respondents were then offered eleven possible alternative ranges of earnings for each group (this includes open ended upper and lower bands).

In the case of Australia management respondents were asked to report the gross weekly earnings (before taxation and any deductions) of full-time permanent employees in each of eight occupational groups – labourers and unskilled manuals, plant and machine operators and drivers, sales and personal service workers, clerks, tradespersons, para-professionals, professionals and managers. Twelve possible alternative ranges of earnings were available for each group (also including open ended upper and lower bands). Respondents were asked to identify three separate responses for each group – “lowest”, “most” and “highest”. To be as comparable as we can with the data from WIRS3 we used the information from the “most” category.

For empirical implementation in both countries mid-points were allocated to the ranges and the end classes were closed in an inevitably *ad hoc* way. The results were relatively stable to differences in values allocated to the open upper class interval.

In Table 9 we report a series of log earnings equations for Great Britain. The controls have been used in a number of earlier papers and are by now relatively standard and uncontroversial (see BLANCHFLOWER [1984] using WIRS1, BLANCHFLOWER, OSWALD and GARRETT [1990] for WIRS2 and BLANCHFLOWER and OSWALD [1994] for WIRS1, 2 and 3). As the question asks for the manager at the workplace to report a wage of the majority sex worker, we include a dummy variable to indicate if this worker is male or female. In every equation earnings are lower if the majority sex worker in the occupation was female, even controlling for the proportion of females in the workforce as a whole. In four of the five skill groups there is some evidence that earnings are lower where there are many competitors when no other controls (except the majority sex male dummy variable) are included – the exception is supervisors (“t”=1.38). When controls are added for establishment size, union recognition, workforce structure, shiftwork, industry, foreign ownership and the local area unemployment rate then the coefficient on the “many competitors” variable becomes insignificant in the unskilled manual, semi-skilled manual and clerical equations. However, it remains significant in the skilled worker equation (“t”=2.0).

In Table 10 we report estimated wage equations for eight groups of workers for Australia. In six of the eight cases the many competitors variable is significantly negative in the absence of control variables: the exceptions are professionals and para-professionals. We then add a series of controls which are as comparable to those we used above for Great Britain as we are able to construct. Once we add these control variables the coefficient on the “many competitors” variable is significant only for clericals (“t”=2.14) and weakly so for tradespersons (“t”=1.58). As in the case of Great Britain wages are lower the higher the proportion of females in the workforce. Wages tend to be higher for non-manuals and in foreign-owned firms. Having a union present appears to convey a premium for only unskilled manual workers.

Somewhat unusually given the large body of literature that has documented a positive relationship between earnings and establishment size (see, for

TABLE 9

*Estimated Wage Equations for British Workplaces*

	Skilled Manuals	Semi-Skilled Manuals	Unskilled Manuals	Supervisors/Foremen	Clerical
Constant	5.480 (.014)	4.055 (.242)	5.291 (.017)	5.586 (.014)	5.439 (.246)
Many competitors	-.072 (.020)	-.042 (.021)	-.063 (.024)	-.027 (.020)	-.040 (.018)
Majority sex male	.499 (.038)	.136 (.049)	.449 (.030)	.316 (.023)	.172 (.025)
Public		.050 (.055)	.042 (.065)	.079 (.091)	.017 (.059)
50-99 employees		.027 (.037)	.061 (.046)	.008 (.055)	.055 (.072)
100-199 employees		.115 (.040)	.155 (.047)	.089 (.058)	.038 (.069)
200-499 employees		.106 (.043)	.190 (.053)	.113 (.063)	.123 (.070)
500-999 employees		.109 (.047)	.151 (.057)	.140 (.070)	.124 (.071)
1000 or more employees		.163 (.047)	.230 (.057)	.211 (.070)	.201 (.071)
Percentage manual		-.0012 (.0006)	-.0008 (.0007)	.0004 (.0009)	.0006 (.0005)
Percentage female		-.0035 (.0006)	-.0058 (.0008)	-.0054 (.0010)	-.0040 (.0006)
Shiftwork		-.016 (.028)	.042 (.065)	.033 (.041)	-.045 (.028)
UK/Foreign Owned		-.062 (.061)	-.138 (.076)	-.059 (.101)	.001 (.058)

TABLE 9 (Continued)

	Skilled Manuals	Semi-Skilled Manuals	Unskilled Manuals	Supervisors/Foremen	Clerical
Foreign Owned	.017 (.027)	.007 (.033)	.048 (.048)	.044 (.026)	.088 (.025)
Log(u rate)	-.031 (.019)	-.033 (.023)	-.049 (.029)	-.014 (.019)	-.071 (.018)
Union recognised	-.036 (.027)	.019 (.032)	-.002 (.041)	-.041 (.027)	-.055 (.025)
Closed shop	.060 (.040)	-.028 (.047)	-.004 (.065)	-.037 (.039)	-.004 (.039)
50 Industry Dummies	No	No	No	No	No
R <sup>2</sup>	.203	.272	.530	.232	.353
Sample size	755	691	598	687	764

1. Ordinary least squares estimates of semi-log wage equations. Standard errors in parentheses.

2. u rate is the local labour market unemployment rate.

TABLE 10

*Estimated Wage Equations for Australian Workplaces*

	Labourers and Unskilled Workers		Plant and Machine Operators		Sales and Personal Service Workers		Clerks	
Constant	5.911 (.022)	5.716 (.229)	6.086 (.019)	5.835 (.247)	6.123 (.033)	6.189 (.067)	6.051 (.016)	5.987 (.036)
Many competitors	-.105 (.029)	-.007 (.029)	-.083 (.027)	-.034 (.027)	-.103 (.041)	-.015 (.038)	-.094 (.020)	-.056 (.020)
Public		.039 (.063)		-.044 (.054)		-.069 (.082)		-.003 (.037)
50-99 employees		-.035 (.039)		.022 (.040)		.074 (.047)		.101 (.025)
100-199 employees		-.037 (.044)		.047 (.043)		.088 (.050)		.123 (.028)
200-499 employees		.003 (.050)		.055 (.045)		.085 (.062)		.162 (.032)
500-999 employees		.022 (.057)		.097 (.054)		.105 (.072)		.212 (.038)
1000 or more employees		.030 (.087)		.095 (.078)		.133 (.109)		.228 (.061)
Percentage part-time		.0008 (.0013)		.0011 (.0025)		-.177 (.153)		-.041 (.084)
Percentage female		-.0022 (.0008)		-.0028 (.0009)		-.539 (.089)		-.279 (.046)
Predominantly Australian		.050 (.043)		-.061 (.042)		-.080 (.048)		-.009 (.028)
Foreign Owned		.017 (.046)		.057 (.045)		.123 (.057)		.111 (.030)

TABLE 10 (Continued)

	Labourers and Unskilled Workers	Plant and Machine Operators	Sales and Personal Service Workers	Clerks
Predominantly Foreign . . . . .	.003 (.056)	-.007 (.047)	-.050 (.074)	.006 (.038)
Jointly Owned . . . . .	-.294 (.159)	.226 (.287)	-.063 (.228)	-.212 (.127)
Domestic and import . . . . .	.044 (.032)	-.010 (.030)	.175 (.036)	.002 (.020)
Export . . . . .	-.069 (.074)	.103 (.062)	.146 (.104)	.011 (.050)
Union present . . . . .	.145 (.042)	.023 (.046)	.001 (.049)	-.035 (.027)
34 Industry Dummies . . . . .	No	Yes	Yes	No
R <sup>2</sup> . . . . .	.022	.024	.012	.029
Number of establishments . . . . .	586	389	516	743

I. Ordinary least squares estimates of semi-log wage equations. Standard errors in parentheses.



TABLE 10 (Continued)

	Tradespersons		Para-Professionals		Professionals		Managers	
Constant	6.214 (.018)	6.199 (.045)	6.394 (.021)	6.398 (.020)	6.593 (.020)	6.507 (.055)	6.721 (.022)	6.199 (.045)
Many competitors	-.089 (.023)	-.050 (.024)	-.016 (.029)	.014 (.030)	-.001 (.027)	-.013 (.029)	-.114 (.027)	-.026 (.025)
Public		-.068 (.047)		-.095 (.054)		.079 (.056)		-.017 (.049)
50-99 employees		.004 (.034)		.028 (.048)		.003 (.045)		.062 (.032)
100-199 employees		.009 (.037)		.028 (.051)		.049 (.047)		.120 (.034)
200-499 employees		.084 (.041)		-.026 (.053)		.062 (.050)		.185 (.040)
500-999 employees		.059 (.047)		.021 (.058)		.096 (.057)		.162 (.048)
1000 or more employees		-.006 (.067)		.001 (.080)		-.039 (.084)		.187 (.074)
Proportion part-time		-.041 (.126)		-.286 (.127)		-.211 (.142)		-.025 (.095)
Proportion female		-.157 (.058)		-.223 (.073)		-.480 (.075)		-.321 (.056)
Predominantly Australian		-.032 (.034)		.028 (.048)		.008 (.047)		-.032 (.035)
Foreign Owned		.035 (.039)		.061 (.044)		.069 (.041)		.105 (.036)

TABLE 10 (Continued)

	Tradespersons		Para-Professionals		Professionals		Managers	
	No	Yes	No	Yes	No	Yes	No	Yes
Predominantly Foreign . . . . .		.028 (.043)		.055 (.050)		.075 (.048)		.132 (.049)
Jointly Owned . . . . .		-.110 (.151)		.055 (.280)		-.036 (.278)		-.055 (.135)
Domestic and import . . . . .		.004 (.025)		-.019 (.034)		.043 (.031)		.068 (.025)
Export . . . . .		.075 (.055)		.023 (.070)		.195 (.067)		.128 (.066)
Union present . . . . .		.037 (.036)		.039 (.048)		-.029 (.041)		-.061 (.031)
34 Industry dummies . . . . .	No	Yes	No	Yes	No	Yes	No	Yes
R <sup>2</sup> . . . . .	.026	.200	.001	.157	.000	.109	.023	.365
Number of establishments . . . . .	537	533	374	373	385	383	729	722

I. Ordinary least squares estimates of semi-log wage equations. Standard errors in parentheses.

example, BROWN, HAMILTON and MEDOFF [1990], and in contrast to the results reported in Table 9 for Great Britain, we find no evidence among manual workers that wages are correlated with establishment size in Australia. Among the non-manuals there is evidence of a positive correlation for sales workers, clericals and managers, but not for para-professionals or professionals.

Another aspect of competitive behaviour is export performance. In the Australian survey respondents are asked about whether their principal sales activity is in the export market. In the British data only a sub-set of respondents, the financial managers, are asked a question about the nature of their market so that sample sizes become small (particularly for estimating regression models) <sup>8</sup>. We have, however, considered the potential role for better export performance to influence wages. Despite the small sample sizes in the British results, there is some evidence that improved export performance is associated with higher wages for upper grade non-manuals, though there is no discernible effect for manual workers in both countries <sup>9</sup>.

## 5 Concluding Remarks

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In this paper we use microeconomic establishment-level data to consider one of the most basic propositions in economics, namely that more competition reduces wages and enhances labour productivity. To evaluate this viewpoint we use data from two countries, Australia and Britain, to look empirically at the relationship between wages, productivity and the extent of market competition.

Our study is novel in the sense that uses disaggregated data that circumvents some of the problems that have plagued many studies that look at the impact of product market competition. Whilst the qualitative

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8. The financial manager questionnaire was conducted in 489 of the total sample of 2061 establishments in WIRS3.

9. See Table 10 for Australian results where the exports variable attracts a positive and significant coefficient for professionals and managers. For British workplaces the following results were obtained for the smaller financial managers sample which suggest a positive exports effect for supervisors/foremen:

	Skilled	Semi-skilled	Unskilled	Supervisors/ Foremen	Clericals
Domestic with import competition . . . . .	.019 (.042)	.058 (.048)	.093 (.068)	.137 (.039)	.057 (.036)
Primarily export . . . . .	-.033 (.054)	.042 (.062)	.106 (.090)	.176 (.053)	.089 (.048)
Number of establishments . . . . .	240	224	218	261	285

The reference group is Domestic with no import competition. All equations include the same controls as the full specifications in Table 9. Other notes as Table 9.

nature of the data we use does introduce new problems, we have evidence that covers the whole economy, and that looks at the determinants of wages and productivity at workplace level. As such our results provide a useful counterpoint to existing work that often suffers from aggregation issues, measurement problems or from having to focus on specific sectors (usually manufacturing).

The evidence that we report on the determinants of productivity, like much of the related econometric work on this issue, finds it hard to identify any systematic link between productivity and competition. In the British data we cannot find any significant competition effects and in Australia there is only evidence of a positive competition effect in manufacturing establishments. With respect to wages, simple data descriptions suggest that establishments that face more competitors (5 or more) do pay lower wages, but this effect only remains intact for some of the skill groups that we consider when we control for various other factors. The same is true of firms who mainly operate in export markets, where we detect positive wage effects for some non-manual workers in both countries, but no important effects for manual employees.

Overall the empirical work that we present is suggestive of rather limited support for the competition hypothesis. Whilst there is some evidence of a product market competition effect in some situations, it seems that other factors, especially those related to labour market outcomes (especially unionization, worker characteristics and, in Britain, employer size), are more important determinants of wages and productivity in British and Australian workplaces.

## APPENDIX

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### *Details on the British 1990 Workplace Industrial Relations Survey (WIRS3)*

There are three Workplace Industrial Relations Surveys, that were carried out in 1980, 1984 and 1990. The sample design for the 1990 main survey broadly followed that developed for previous surveys. The sampling frame was the Employment Department's 1987 Census of Employment (for the 1984 survey it was the Census conducted in 1981; and for the 1980 survey it was the Census conducted in 1977). As in previous surveys, all Census units recorded as having 24 or fewer employees were excluded, as were units falling within Agriculture, Forestry and Fishing (Division 0) of the Standard Industrial Classification (1980). Otherwise all sectors of civil employment in England, Scotland and Wales were included in the sampling universe (public and private sector, manufacturing and service industries). In 1990, as in previous surveys, larger units (on the basis of number of employees) were oversampled.

A Census unit is, in most cases, a number of employees working at the same address who are paid from the same location by the same employer. The requirement of the survey design was for a sample of establishments (that is, individual places of employment at a single address and covering all the employees of the identified employer at that address). In general, there is a sufficient degree of correspondence between Census units and establishments for the Census to serve as a viable sampling frame for the survey series. However, some Census units have been found to refer to more than one establishment and in others to just part of an establishment.

At the time of the design of the 1990 sample, the 1987 Census of Employment file contained just over 142,000 units with 25 or more employees, which is slightly more than the 135,000 in the 1981 Census used for the 1984 survey. A stratified random sample totalling 3,577 units was drawn (in 1984 the figure was 3,640 units and in 1980 the figure was 3,994 units). The selected sample was smaller in 1990 for two reasons. Firstly, the number of establishments at which interviews were required was 1,870, as against 2,000 in the first survey. Secondly, as none of the "reserve pool" of nearly 500 units had been used in 1984 and the 1984 experience gave a good guide to the extent of out-of-scope and non-responding addresses, the size of the reserve pool in 1990 could be reduced. In the event none of the 358 units selected for the 1990 reserve pool were used.

The selection of units from the Census file involved an initial division of the file into seven files, each containing units within a size range: 25 to 49 employees, 50 to 99 employees, and so on. Within each file the Census units were then re-ordered by: the proportion of male employees, within the proportion of full-time employees, within the Activities of the Standard Industrial Classification (SIC). Differential sampling fractions were applied to the six lower size bands, the seventh (top) band having the same sampling fraction as the sixth band. From the re-ordered lists, samples were selected

by marking off at intervals from a randomly selected starting point, the list being treated as circular.

The range of sampling fractions employed has been progressively increased during the course of the series. Partly this was because the number of large units in the population has declined and we still wanted to have sufficient large establishments of different sizes. It also reflected an increased emphasis on estimates focusing on employees rather than establishments. Analysis of the 1980 results had shown that employee estimates could be improved with little loss of accuracy on establishment estimates if the sample contained more large, and fewer small, units.

Besides the withdrawal of the ten per cent of addresses for the reserve pool, the sample selected in 1990 was also reduced by a further 210 addresses from SIC Classes 91, 93 and 95. This innovation was made because analysis of the previous surveys had demonstrated that there was less variation within these easily identifiable parts of the public sector on most of the matters of interest in the surveys. It seemed advisable, therefore, to spread the survey resources that could be saved by undersampling these sectors over the remaining sectors of the population. The result of these two types of withdrawal from the selected sample – the reserve pool and the undersampling of Classes 91, 93 and 95 – was to bring the number of units in the initial sample down to 3,009.

In 1984, all addresses in the deep coal-mining industry had been withdrawn from the sample prior to fieldwork, owing to the industry-wide dispute current at the time. In 1990 the deep coal-mining industry was again excluded so that the industrial coverage of the three surveys in the series would be identical.

Interviewing started in late January, shortly after the main interviewer briefings, and continued until September 1990, with the bulk of interviews taking place in February to April. The median date for the main management interviews was late March, compared with May for the two previous surveys. The final sample size was 2,061 establishments.

### ***Details on the Australian 1989/1990 Workplace Industrial Relations Survey (AWIRS)***

The units of analyses for AWIRS are called locations, which the Australian Bureau of Statistics (ABS) defines as “a single physical area occupied by the establishment from which it engages in productive activity on a relatively permanent basis”. The ABS classifies workplaces in a number of ways, including locations, establishments of enterprises. “Locations”, such as a bank branch or a council works depot, are a smaller classificatory unit than establishments which may control or be responsible for a number of locations – for example, regional bank offices or council chambers are establishments. An enterprise can cover all the operations in Australia (locations in all establishments) of a single operating legal entity. These definitions apply to both the private and public sectors. Single one-location workplaces that are not part of a larger organisation – for example, an independent hairdressing salon or newsagency – would appear in each of these classificatory independent hairdressing salon or newsagency – would appear in each of these classificatory levels. Further, a head office of an

TABLE A1

*Industry Breakdowns of Competition Measures in the Two Countries*

1. Australia – Market Competition				
	No Competitors	Few Competitors	Many Competitors	Number of Establishments (Weighted)
Manufacturing . . . . .	.015	.450	.535	358
Utilities . . . . .	.376	.599	.025	20
Constructions . . . . .	.012	.272	.716	54
Wholesale and Retail Trade . . . . .	.018	.147	.835	316
Transportation . . . . .	.077	.499	.424	49
Communication . . . . .	.061	.676	.263	28
Banking . . . . .	.007	.141	.852	143
Commercial Services . . . . .	.179	.380	.441	85
Other Service . . . . .	.024	.218	.757	146
All . . . . .	.037	.302	.661	1,200

2. Britain – Market Competition				
	No competitors	Few Competitors	Many Competitors	Number of Establishments (Weighted)
Manufacturing . . . . .	.056	.403	.541	387
Utilities . . . . .	.720	.140	.140	16
Construction . . . . .	.045	.117	.838	62
Wholesale and Retail Trade . . . . .	.071	.254	.675	375
Transportation . . . . .	.019	.318	.663	61
Communication . . . . .	.627	.340	.032	44
Ranking . . . . .	.042	.228	.730	201
Commercial Services . . . . .	.055	.375	.570	83
Other Services . . . . .	.118	.348	.534	26
All . . . . .	.086	.304	.611	1,256

organisation may be classified as a location and/or an enterprise, depending on its organisational character.

Because the AWIRS sample – head offices, regional offices, worksites and branches, as well as single or independent workplaces that were not part of a larger enterprise group. When a workplace address housed complex and diverse organisational structures or administrative units, in terms of industrial relations, it was regarded as consisting of several separate workplaces. In such cases, the survey reviewed the industrial relations structures and practices of the workplace (or part of the organisation) with the greatest number of employees. Problems also arise with multi-location organisations when a number of workplaces may be controlled centrally. This because industrial relations practices and structures may be determined elsewhere in the organisation. To minimize the effect of these problems the questionnaires were designed to measure workplace autonomy and dependence within the organisation.

AWIRS consist of two surveys. First, a survey was conducted of 2,004 workplaces with a minimum of twenty employees covering all

TABLE A2

*Industry Breakdowns of Competition Measures in the Two Countries*

1. Australia – Relative Productivity						
	A Lot Above Average	A Little Above Average	About Average	A Little Below Average	A Lot Below Average	Number of Establish- ments (Weighted)
Manufacturing . . . . .	.087	.371	.373	.147	.022	313
Utilities . . . . .	.083	.431	.449	.007	.030	18
Construction . . . . .	.064	.198	.559	.148	.032	48
Wholesale and Retail Trade . . . . .	.106	.317	.461	.105	.011	258
Transportation . . . . .	.055	.174	.576	.196	.000	35
Communication . . . . .	.039	.381	.532	.047	.000	37
Banking . . . . .	.129	.356	.425	.078	.012	153
Commercial Services . . . . .	.201	.406	.237	.143	.012	54
Other Services . . . . .	.129	.253	.489	.129	.000	116
All . . . . .	.105	.331	.432	.119	.014	1,031
2. Britain — Relative Productivity						
	A Lot Above Average	A Little Above Average	About Average	A Little Below Average	A Lot Below Average	Number of Establish- ments (Weighted)
Manufacturing . . . . .	.107	.355	.458	.068	.012	347
Utilities . . . . .	.060	.171	.736	.032	.000	17
Construction . . . . .	.105	.497	.391	.008	.000	58
Wholesale and Retail Trade . . . . .	.138	.374	.389	.099	.000	354
Transportation . . . . .	.334	.149	.376	.103	.037	52
Communication . . . . .	.066	.180	.505	.228	.020	38
Banking . . . . .	.133	.281	.469	.110	.007	193
Commercial Services . . . . .	.273	.207	.406	.114	.000	75
Other Services . . . . .	.230	.097	.592	.081	.000	24
All . . . . .	.142	.323	.437	.091	.007	1,158

States and Territories and all industries with the exception of agriculture and defense. This involved face-to-face interview with approximately 4,500 managers and, where present, union delegates. Second, a survey of managers was conducted by telephone at 349 workplaces with between five and nineteen employees. It used a shorter questionnaire covering general industrial relations matters and some specific issues relevant to workplaces with a small number of employees. The sample frames for both surveys were designed by the Statistical Consultancy Section of Australian Bureau of Statistics (ABS) on the basis of Department of Industrial Relations (DIR) specifications. The sampled workplaces were drawn from the ABS register of all establishments in Australia. The population frame for the personal interview survey included all workplace locations with twenty or more employees, excluding the agriculture, forestry, fishing and hunting and defense industries. These industries were excluded because of sampling difficulties in the agricultural sector and the unique nature of industrial



relations in the defense industry. The sample frame was stratified into metropolitan (capital cities only) and non-metropolitan workplaces, and further stratified by the eight States and Territories, four employment-size bands and twenty one industry groups. The sample was also designed to produce equal relative standard errors for specified employment group estimates. AWIRS sampled a greater number of large workplaces than if workplaces had been selected by a simple random method. This was to allow for analysis by size. As most of Australia's workforce is employed by a relatively small number of large workplaces, this ensured the survey covered workplaces that employ the majority of the workforce. The sample included approximately 1 in 33 workplaces with twenty to forty-nine employees, 1 in 13 workplaces with fifty to ninety-nine employees, 1 in 9 workplaces with between 100 and 499 employees and 1 in 2.2 workplaces in the 500 and more size band. The sampling technique used for AWIRS required that weighted data be used for population estimates of workplaces or employment numbers. The non-metropolitan sample was clustered by postcode.

Interviews were conducted in an average of five workplaces per 100 of the possible 1,000 non-metropolitan postcodes. The sample for the small workplace telephone survey was less complex and allowed for national estimates of workplaces with between five and nineteen employees. Because there are about 92,000 workplaces with between five and nineteen employees, the average sampling fraction for the telephone survey was 1 in 260. The sample was designed to allow disaggregation and reliable estimates for public and private sector workplaces, manufacturing and non-manufacturing workplaces; organisational status of workplaces; and two size bands. Data from this survey can be combined with the data from the survey of workplaces with twenty or more employees to allow some comparisons between small and large workplaces.

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