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## UNIONISM AND EMPLOYMENT BEHAVIOUR\*

*David G. Blanchflower, Neil Millward and Andrew J. Oswald*

For many decades the study of the effects of trade unions upon wages has been both a central part of labour economics and one of the most intensively researched parts of applied economics. For the United States alone, Lewis (1986) surveys approximately two hundred econometric studies.<sup>1</sup> As Hamermesh and Rees (1988), Hirsch and Addison (1986) and Freeman and Medoff (1984) all note,<sup>2</sup> however, there is almost no equivalent evidence on the consequences of trade union activity for the level and growth of employment.<sup>3</sup> This paper is an attempt to help fill that gap. It uses a microeconomic data set on British establishments to examine the effects of unionism upon employment behaviour.

There is one new study which is similar to our own. Leonard (1991) uses data on Californian manufacturing plants to examine the correlation between unionism and the rate of employment growth.<sup>4</sup> He concludes that employment grows significantly slower in union than in non-union plants 'by approximately two to four percentage points a year'. Although his study and ours were conducted independently, the results are similar. The main finding of our paper is that employment in the typical British union establishment grows, *ceteris paribus*, around three percentage points slower than in a typical non-union establishment.

Although these are, as far as we know, the first two papers to examine the effects of unionism upon jobs at the establishment level, there is a small literature that treats the issue differently. Kahn (1978), Holzer (1982) and Montgomery (1989) attempt to calculate the employment consequences of trade unionism by using microeconomic data on individuals. They estimate

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<sup>1</sup> Further reviews are available in Freeman and Medoff (1984), Farber (1986) and Hirsch and Addison (1986).

<sup>2</sup> See, for example, the discussion on p. 309 of Hamermesh and Rees (1988). Addison and Hirsch (1989) is a recent survey which calls for further research on the dynamic effects of trade unions.

<sup>3</sup> There is a small symposium in the *European Economic Review* (see, for example, Oswald (1988), Freeman (1988) and Blanchflower and Millward (1988)). Few unambiguous conclusions emerge. Other work on the topic, Clark (1984), finds weak union effects on the rate of change of output, but does not examine the employment consequences of unionisation. Dunne *et al.* (1989) study employment change in the United States, although they do not focus on the impact of unions.

<sup>4</sup> Earlier results were contained in Leonard (1985), which was drawn to our attention by Larry Katz at a Harvard seminar presentation of our work.

people's probability of unemployment as a function of, among other things, the proportion of union membership in their geographical area. Whilst this is an indirect way to study what unions do to jobs, and some of the results are mixed, the studies suggest a positive correlation between unionism and unemployment. They are thus consistent with the traditional theoretical view (discussed below) that trade unions are likely to have deleterious effects on the availability of employment. Mildly supportive results also come from a valuable study by Pencavel and Hartsog (1984). These authors use US time-series data from 1920–80, and conclude that there is some evidence of a negative effect of unionism upon relative man-hours worked, but that the estimated standard errors are too large to allow confident conclusions to be drawn.<sup>5</sup>

Trade unions raise wages.<sup>6</sup> Traditional economic analysis thus suggests that the existence of a trade union is likely to depress the level of employment. This assumes that wage-employment combinations lie on a labour demand curve.<sup>7</sup> Alternatively, however, it is possible to argue that a trade union might increase, or have no effect upon, the number of jobs. This view is based upon the idea of a vertical or upward-sloping efficiency locus, or contract curve, in wage/employment space.<sup>8</sup> The relative merits of these two approaches are still debated, and empirical evidence on the effects of unions upon employment may have some relevance for that debate.

The paper has four further sections. Section I describes the 1984 *Workplace Industrial Relations Survey* and presents cross-tabulations on the simple correlation between unionism and the rate of growth of employment. A strong negative correlation is found. Sections II and III attempt to answer the obvious questions suggested by this correlation: they allow for industry, regional and establishment characteristics. Even with up to two hundred control variables – most of them highly disaggregated industry dummy variables – there continues to be evidence of a statistically significant negative effect of unionism upon employment growth. Section IV summarizes the conclusions. Appendix 1 discusses some recent criticisms of our results.

#### I. THE DATA

The *British Workplace Industrial Relations Survey* of 1984 (WIRS2), which is the data source used in this paper, was sponsored by the Department of Employment, the Policy Studies Institute, the Economic and Social Research Council, and the Advisory, Conciliation and Arbitration Service. The sampling frame was the 1981 *Census of Employment*. To be included in the survey an

<sup>5</sup> Perloff and Sickles (1987) obtain a negative effect of unionism upon male hours worked in a study of construction using the 1973–1975 *Current Population Surveys*. There is a small US literature on the impact of public sector unions on employment (see, for example, Zax 1989) that finds positive or zero effects.

<sup>6</sup> Evidence for the US is summarised in Lewis (1986) and Freeman and Medoff (1984), and for Britain in Stewart (1983), Blanchflower (1984) and Blanchflower, Oswald and Garrett (1989). Union wage differentials for both countries are typically ten to twenty percent. The British union wage differential appears to have changed little over the last decade (see Blanchflower (1991)).

<sup>7</sup> As in the monopoly union models of Dunlop (1944) and Oswald (1982). It is possible that there are additional effects of unions upon employment because of productivity or non-pecuniary impacts of unions. Hence, it is not necessarily correct to say, as a reader has suggested, that employment effects can be gleaned simply from knowledge of union wage differentials and labour demand elasticities alone.

<sup>8</sup> As in the efficient bargain models of Leontief (1946) and McDonald and Solow (1981).

establishment had to have at least 25 employees (full or part-time) both in 1981 and 1984. The survey covered England, Scotland and Wales, and its industrial coverage was all manufacturing and services in both the public and private sectors.

A sample of 2,019 establishments (defined as 'places of employment at a single address or site') was achieved, being an overall response rate of 77%. This sample is divided approximately six to four between unionised and non-unionised establishments (in 1984 roughly 50% of Britain's employees were members of trade unions) and thus allows a comparison of their performance and behaviour. Establishments were selected differentially across establishment size bands, with large establishments over-sampled. The data are weighted to compensate for these inequalities of selection. The survey incorporated personal interviews with the senior manager responsible for dealing with employee relations, industrial relations or personnel matters, plus interviews with worker representatives and, where appropriate, with works managers. This paper uses only data obtained from the senior manager's interview. For details of the weighting scheme, and the design and selection of the sample, see Millward and Stevens (1986, Technical Appendix).

Table 1 sets out descriptive statistics for the employment growth rates of British establishments. The elements in the tables add horizontally to 100%. Thus, for example, 17% of establishments declined by one fifth or more between 1980 and 1984; 20% grew by one fifth or more. There is clear evidence that the rate of change of employment is correlated with size. Only 4% of establishments with more than 2,000 employees increased by one fifth or more, compared with 20% for all sizes of establishment. As might be expected, small establishments grow proportionately most quickly.

Table 2 gives the equivalent statistics for establishments with different degrees of unionisation. Union strength is measured in two ways:

- (1) as the three categories 'non-union', 'open-shop' and 'closed-shop',
- (2) as the percentage of workers in the establishment who are union members.

With either of these measures, a strong inverse correlation between union strength and employment growth is apparent. For example, one third of all establishments in the non-union sector increased in size by more than one fifth. The figure for closed-shop union establishments, however, was less than one in ten. A similar result holds among the fastest declining establishments. A much larger proportion of the unionised establishments experienced more than a 20% reduction in employment. This tendency is especially marked in the private sector. Of all plants with zero union membership, 52% grew by more than 5% between 1980 and 1984. By contrast, of plants with union density of more than 75%, only 23% grew by this amount over the same period.

## II. EMPLOYMENT EQUATIONS

The cross-tabulations of the previous section reveal that on average Britain's unionised plants grew more slowly, or declined more quickly, than did non-unionised plants. There are three obvious objections to the hypothesis that this correlation reflects a causal mechanism from unionism to the number of jobs.

Table 1  
*Change in Employment, 1980-4*

|                                   | Decrease of<br>20% or more | Decrease of<br>5% to 20% | Stable | Increase of<br>5% to 20% | Increase of<br>20% or more | Weighted<br>numbers |
|-----------------------------------|----------------------------|--------------------------|--------|--------------------------|----------------------------|---------------------|
| All Establishments                | 17                         | 27                       | 20     | 16                       | 20                         | 1,624               |
| No. of employees at establishment |                            |                          |        |                          |                            |                     |
| 25-49                             | 15                         | 29                       | 21     | 18                       | 18                         | 824                 |
| 50-99                             | 16                         | 26                       | 19     | 14                       | 26                         | 436                 |
| 100-199                           | 21                         | 25                       | 19     | 20                       | 16                         | 200                 |
| 200-499                           | 23                         | 23                       | 22     | 13                       | 19                         | 112                 |
| 500-999                           | 26                         | 25                       | 18     | 13                       | 18                         | 32                  |
| 1000-1999                         | 21                         | 45                       | 22     | 9                        | 4                          | 13                  |
| 2000 or more                      | 27                         | 26                       | 28     | 14                       | 4                          | 5                   |
| Private sector                    | 22                         | 23                       | 15     | 16                       | 25                         | 1,044               |
| Private manufacturing             | 33                         | 21                       | 10     | 11                       | 25                         | 378                 |
| Private services                  | 15                         | 24                       | 17     | 19                       | 24                         | 666                 |

\* Row percentages.

Base: those establishments where the 1980 employment size was reported.

Source: 1984 *Workplace Industrial Relations Survey*.

Table 2  
*Change in Employment, 1980-4*

|                    | Decrease of<br>20% or more | Decrease of<br>5% to 20% | Stable | Increase of<br>5% to 20% | Row percentages            |                     |
|--------------------|----------------------------|--------------------------|--------|--------------------------|----------------------------|---------------------|
|                    |                            |                          |        |                          | Increase of<br>20% or more | Weighted<br>numbers |
| All Establishments | 17                         | 27                       | 20     | 16                       | 20                         | 1,624               |
| Non-union          | 14                         | 19                       | 16     | 17                       | 33                         | 560                 |
| Open shop          | 15                         | 33                       | 21     | 17                       | 14                         | 794                 |
| Closed shop        | 27                         | 29                       | 25     | 13                       | 8                          | 269                 |
| Union membership   |                            |                          |        |                          |                            |                     |
| 0%                 | 15                         | 19                       | 14     | 18                       | 34                         | 448                 |
| > 0% to 25%        | 20                         | 26                       | 19     | 13                       | 22                         | 184                 |
| > 25% to 50%       | 19                         | 35                       | 14     | 18                       | 13                         | 160                 |
| > 50% to 75%       | 15                         | 33                       | 21     | 20                       | 12                         | 335                 |
| > 75%              | 19                         | 30                       | 27     | 12                       | 11                         | 384                 |
| Private sector     | 22                         | 23                       | 15     | 16                       | 25                         | 1,044               |
| Non-union          | 15                         | 19                       | 16     | 17                       | 33                         | 550                 |
| Open shop          | 27                         | 25                       | 14     | 17                       | 18                         | 352                 |
| Closed shop        | 37                         | 30                       | 13     | 12                       | 9                          | 142                 |
| Union membership   |                            |                          |        |                          |                            |                     |
| 0%                 | 15                         | 19                       | 14     | 18                       | 34                         | 447                 |
| > 0% to 25%        | 20                         | 23                       | 21     | 14                       | 23                         | 146                 |
| > 25% to 50%       | 32                         | 22                       | 12     | 18                       | 16                         | 95                  |
| > 50% to 75%       | 25                         | 31                       | 14     | 17                       | 14                         | 155                 |
| > 75%              | 36                         | 28                       | 12     | 9                        | 9                          | 150                 |

\* Row percentages.

Base: those establishments where the 1980 employment size was reported.

Source: 1984 *Workplace Industrial Relations Survey*.

Notes: 'Open shop' defined as where unions were recognised by management for bargaining over pay and conditions but no compulsory union membership. 'Closed shop' defined as where at least one group of workers had to be members of a trade union to obtain or keep their jobs.

First, the data show that small establishments expanded faster than large establishments, and it is known that there is a positive relationship between workplace size and the proportion of employees who belong to trade unions. Second, British private sector trade unions are most heavily represented in traditional (so called 'declining') industries, especially in certain forms of manufacturing. If, as is often claimed, these sectors are dwindling for exogenous technological reasons, the link between unionism and declining employment is the result of industrial structure and part of a historical process. Third, rates of unionisation are highest in regions such as Scotland and the north of England, namely, the higher unemployment and lower income areas of Great Britain (see Millward and Stevens (1988)). Again this may produce a spurious correlation between low speed of job growth and the existence of trade unions.

A related line of argument focuses on demand conditions across establishments. The cross-tabulations allow no adjustment for the fact that some plants between 1980 and 1984 enjoyed increased product demand. To control properly for this, however, is intrinsically difficult. If the existence of a union leads – through pressure on labour costs and thus selling prices – to reduced sales, the level of demand for the product is not an exogenous variable.

Various other establishment characteristics may affect the rate of employment change. Multi-product plants may suffer less in the downswing of the trade cycle, because they switch away from less profitable products. Older plants may expand more slowly than newer ones. Administrative centres within organisations – workplaces which are themselves head offices – may have different growth characteristics from the plants they oversee.

Although the 1984 *Workplace Industrial Relations Survey* is not a panel, it records the numbers of workers employed in 1980, 1983 and 1984. It also gives information about each establishment in 1984, including its industrial and regional classification, the form and extent of unionisation, and many details of its type. Various questions were also asked about sales and financial performance. To reduce the question non-response, however, on these issues the survey required only qualitative information.

In our analysis we estimate various forms of unrestricted employment equations. This preserves symmetry with the reduced-form methodology used in the cross-section literature on union wage differentials. Because it is known that employment functions are highly autoregressive (Hamermesh (1986) and Nickell (1986)), it will be necessary to include lagged values of employment as independent variables.

Although it would be desirable to study the effects of unionisation on the probability of plant closure, that is not possible with the data set available. The *Workplace Industrial Relations Survey* provides details on plants that closed between the time the sample was drawn (1981) and the date of the survey (1984). However, there is no record of the union status of any of these plants. If closures are more likely under a union, our estimate understates the total effect of unionisation upon jobs. If unions reduce the likelihood of closure, our estimate overstates the aggregate effect. The results in this paper should be seen strictly as an analysis of employment movements inside continuing estab-

lishments. It is a potentially serious weakness of our analysis that we are unable to model the selection issue.

Two kinds of union variable are used in the estimation. The first is a dummy variable for the existence of a trade union at the workplace. More precisely, it covers establishments where there was in 1984 a trade union which was 'recognised' by management for the purpose of bargaining. Approximately one half of our establishments had a recognised union. A second variable used, containing more information, is the density of union membership at the workplace.

The following variables are also included in OLS regressions explaining employment in 1984.

- (i) The log of employment in both  $t-1$  and  $t-4$  (that is, the years 1983 and 1980, which are the only ones available in the data set),
- (ii) 10 regional dummy variables,
- (iii) 163 industry dummy variables,
- (iv) the county unemployment rate (across 58 British counties),
- (v) a set of establishment characteristics, especially demand, capacity and financial performance variables.

A description of the variables is contained in Appendix 2. Much experimentation was also done with variables not reported in the paper. Various establishment characteristics (age, proportion of females, of part-timers, of white collar workers, etc.) familiar from work on wage equations had little or no explanatory power, once industry dummies were included, and are therefore omitted.

We have chosen to use Ordinary Least Squares for estimation. Although simultaneity bias is possible, it appears unlikely to be a practical problem, because unionism in Britain generally predates employment decline. Evidence in Millward and Stevens (1986, pp. 67-9) suggests that less than one in ten plants changed union status between 1980 and 1984. Therefore, it does not seem credible to argue that employment decline (growth) in 1983-4 caused an increase (decrease) in unionisation.

### III. RESULTS

The principal results are given in Tables 3 and 4. The sample for these tables, using data only on the private sector, is approximately one thousand establishments. The dependent variable is the log of employment in 1984, but it is possible that the equation may be best interpreted as an employment growth regression, because the first lagged dependent variable enters with a coefficient of approximately unity. An alternative interpretation is as an autoregressive function of the level of employment, which would be in line with conventional theory.

All the equations in the Tables could be estimated with the change in employment as the dependent variable. This has no effect on the model's estimated coefficients (it converts a coefficient of, for example, 0.97 on  $E_{t-1}$  into one of -0.03, although it reduces the adjusted  $R^2$ , as in Table A 2). Whether the equations are estimated with the dependent variable as the employment



Table 3  
*Employment Equations with a Union Dummy Variable*

|                         | (1)               | (2)               | (3)               | (4)               | (5)               | (6)               |
|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| $E_{t-1}$               | 0.9681<br>(210.3) | 1.0156<br>(49.50) | 1.0118<br>(49.33) | 1.0150<br>(49.29) | 1.0082<br>(48.83) | 0.9805<br>(49.34) |
| $E_{t-4}$               | —                 | -0.0443<br>(2.29) | -0.0354<br>(1.81) | -0.0369<br>(1.88) | -0.0295<br>(1.49) | -0.0064<br>(0.34) |
| Union recognition       | —                 | —                 | -0.0379<br>(2.59) | -0.0436<br>(2.89) | -0.0369<br>(2.34) | -0.0258<br>(1.70) |
| Regional dummies        | No                | No                | No                | Yes               | Yes               | Yes               |
| Industry dummies        | No                | No                | No                | No                | Yes               | Yes               |
| Demand up               | —                 | —                 | —                 | —                 | —                 | 0.0578<br>(4.47)  |
| Demand down             | —                 | —                 | —                 | —                 | —                 | -0.0306<br>(1.50) |
| Capacity high           | —                 | —                 | —                 | —                 | —                 | 0.0300<br>(2.34)  |
| Capacity low            | —                 | —                 | —                 | —                 | —                 | -0.0885<br>(4.03) |
| Financial performance   | —                 | —                 | —                 | —                 | —                 | 0.0176<br>(2.81)  |
| County unemployment     | —                 | —                 | —                 | —                 | —                 | -0.0295<br>(0.81) |
| Single product          | —                 | —                 | —                 | —                 | —                 | -0.0214<br>(1.66) |
| Head office             | —                 | —                 | —                 | —                 | —                 | -0.0074<br>(0.45) |
| Constant                | 0.1537<br>(6.21)  | 0.1374<br>(5.40)  | 0.1346<br>(5.30)  | 0.1344<br>(4.73)  | 0.1413<br>(3.66)  | 0.1456<br>(1.62)  |
| Adjusted R <sup>2</sup> | 0.9759            | 0.9775            | 0.9776            | 0.9778            | 0.9834            | 0.9852            |
| F                       | 44237.4           | 21449.8           | 14384.6           | 3350.7            | 338.14            | 361.36            |
| N                       | 1,094             | 989               | 989               | 989               | 989               | 989               |

Notes: Dependent variable: natural logarithm of employment,  $E_t$ .  $E_{t-1}$  and  $E_{t-4}$  are in natural logarithms. Union status defined as the existence of a trade union recognised by management for negotiating pay and conditions at the workplace.  $t$ -statistics in parentheses.

level or the one year change in employment is a matter only of presentation. The employment change specification would be equivalent to deducting  $E_{t-1}$  from both sides of the equations presented in Tables 3-5.

The six equations in Table 3 gradually add explanatory variables, building up to the full specification in column 6. Column (3) provides an example. It shows the effects of the addition of a union dummy to the employment equation (which may again be read as an employment growth equation). This union variable enters with a coefficient of approximately  $-0.04$  and a t-statistic of 2.6. The correlation shown in Table 2 between employment change and unionism thus remains even when the regression controls for establishment size.

By column (5) in Table 3, both regional dummies and industry dummies have also been included. Neither the coefficient on unionism nor its level of statistical significance is much altered. It is thus difficult to argue that the association between unionism and poor employment performance is because unions are predominantly in declining industries<sup>9</sup> and regions.

The addition of the (largely demand-related) establishment variables has only slightly more effect. Column 6 reveals that after their inclusion the t-statistic on the union recognition dummy variable falls to 1.7, and the coefficient rises to approximately  $-0.026$  from  $-0.038$ . As the demand, capacity and financial performance variables must be functions of unionism, however, it is likely that the union coefficient in equation 6 is biased downwards. Thus  $-0.0258$  should not be thought of as the reduced-form estimate of the impact of unions. The specification in column 5 of Table 3 is closest to that reduced-form effect.

Table 4 changes to a union density variable, which contains more information, in the statistical sense, than a crude union dummy. For each of the six equations, the level of significance of the union variable is noticeably higher than in Table 3. Even in the full specification, in equation 6 of Table 4, union density enters with a t-statistic of 2.4. The size of the coefficient is relatively stable across the six quite different specifications.

Large numbers of experiments were performed around the reported specifications. Regardless of specification the union density variable was always significant at better than the 5% level. The union dummy was marginally less strong – occasionally its t-statistic fell to 1.5 – but only in the presence of the potentially endogenous demand variables.

The results allow the calculation of a *union employment growth differential*, which is analogous to the union wage differential in the orthodox literature. In Table 3 the coefficients on the union recognition dummy variable vary from  $-0.026$  to  $-0.044$ , and there is a presumption that the true estimate is toward the bottom of this absolute range. Hence a reasonable approximate estimate of the union employment growth differential may be  $-0.03$ : unionised plants thus, *ceteris paribus*, contract three percentage points per annum more quickly than equivalent non-unionised plants.

The idea that unionism reduces the rate of growth of employment sits less

<sup>9</sup> Our own prior belief had been that the addition of such a large number of industry dummy variables would drive the union effect insignificant.

Table 4  
*Employment Equations with a Union Density Variable*

|                             | (1)                | (2)               | (3)               | (4)               | (5)               |
|-----------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| $E_{t-1}$                   | 0.9790<br>(199.93) | 1.0059<br>(53.89) | 1.0083<br>(53.94) | 1.0060<br>(47.49) | 0.9789<br>(48.33) |
| $E_{t-4}$                   | —                  | -0.0237<br>(1.32) | -0.0240<br>(1.34) | -0.0238<br>(1.16) | -0.0032<br>(0.16) |
| Union density $\times 10^3$ | -0.6411<br>(3.69)  | -0.6538<br>(3.62) | -0.7646<br>(3.96) | -0.7881<br>(3.34) | -0.5571<br>(2.42) |
| Regional dummies            | No                 | No                | Yes               | Yes               | Yes               |
| Industry dummies            | No                 | No                | No                | Yes               | Yes               |
| Demand up                   | —                  | —                 | —                 | —                 | 0.0612<br>(4.53)  |
| Demand down                 | —                  | —                 | —                 | —                 | -0.0331<br>(1.57) |
| Capacity high               | —                  | —                 | —                 | —                 | 0.0326<br>(2.44)  |
| Capacity low                | —                  | —                 | —                 | —                 | -0.0977<br>(4.32) |
| Financial performance       | —                  | —                 | —                 | —                 | 0.0160<br>(2.46)  |
| County unemployment         | —                  | —                 | —                 | —                 | -0.0208<br>(0.55) |
| Single product              | —                  | —                 | —                 | —                 | -0.0263<br>(1.96) |
| Head office                 | —                  | —                 | —                 | —                 | -0.0042<br>(0.24) |
| Constant                    | 0.1299<br>(5.49)   | 0.1122<br>(4.69)  | 0.1197<br>(4.45)  | 0.1071<br>(2.29)  | 0.1076<br>(1.09)  |
| Adjusted R <sup>2</sup>     | 0.9797             | 0.9818            | 0.9821            | 0.9830            | 0.9849            |
| F                           | 24774.2            | 16670.2           | 3912.4            | 310.59            | 335.89            |
| N                           | 1,027              | 928               | 928               | 928               | 928               |

Notes: As for Table 3 except the union variable is now the proportion of all workers at the workplace who were union members.

well with neoclassical theory (which suggests the level of employment depends upon the level of the wage) than the view that it reduces the level of employment. Hence it is of interest to consider whether the data are consistent with the 'levels' interpretation. Consider, for example, column 5 of Table 3.<sup>10</sup> The coefficients on lagged employment sum to 0.9787, so the long run elasticity of union recognition upon the level of employment can be calculated from

$$\begin{aligned} \ln E &= 0.9787 \ln E - 0.0369 \text{ union recognition} \\ &= -46.94 (0.0369) \text{ union recognition} \\ &= -1.73 \text{ union recognition} \end{aligned}$$

Therefore, at the mean of employment (97.8 employees), the long-run effect of union recognition is, according to these figures, to reduce the number of jobs at the union workplace to less than one fifth of what employment would have been in the absence of a union. This is an enormous effect (which, according to our figures, would take decades to come through) and we are not sure how seriously to take it.

<sup>10</sup> We would like to thank Dan Hamermesh for suggesting this calculation.

In conclusion, there is evidence, particularly in Table 4, consistent with the view that there is some causal link between trade union activity and employment behaviour. The strong association between unionism and employment decline is robust to the inclusion of control variables.

It is interesting to compare these findings with those of Leonard (1991), which uses a sample of 1,800 Californian manufacturing plants. The author estimates an equation in which the dependent variable is the level of employment in 1980 and includes variables for the level and square of employment in 1974. His estimates imply that employment in union plants grows 2 to 4 percentage points slower than in non-union plants.

Table 5 reports a series of further experiments. The first column removes the first lagged dependent variable,  $E_{t-1}$ . The four year effect of union recognition (remembering that recognition in 1984 is a good proxy for recognition in 1980) is approximately 10 percentage points, which is slightly lower than that implied by compounding the earlier numbers obtained for the one year effect. Column 2 includes only the four year lag on employment and a membership variable which is again statistically significant. Column 3 shows that the union recognition effect is a proxy for a membership effect: the latter drives the former insignificant. This means that statistically the density variable easily dominates the union recognition variable. In column 4, union membership is entered along with a variable that identifies workplaces in which, for one or more groups of workers, membership of a pre- or a post-entry closed shop is compulsory. Interestingly, the post-entry closed shop effect is positive, *ceteris paribus*, so that this extreme form of unionisation appears to slow down the rate of employment decline. The pre-entry closed shop has no independent effect. To explore further the influence of the closed shop we restrict our sample, in column 5, to workplaces without any post-entry closed shops. As expected, the coefficient on membership ( $-0.001304$ ) is nearly double that in column 2 of Table 4 ( $-0.0006538$ ). The fact that the coefficient on the post-entry closed shop dummy is positive runs against the general tenor of our results. It is apparent that further research will be required to disentangle these complex interactions between different kinds of unionism.

Column 6 of Table 5 examines the effects of replacing union variables by a wage rate variable (for unskilled manual workers), and column 7 includes both. The wage enters negatively, which is rare in microeconomic work on labour demand, but has a t-statistic of only 1.3. Nevertheless, the following calculation may be of interest.<sup>11</sup> Because the wage is entered as a natural logarithm, the wage elasticity of labour demand is equal to 0.0253 multiplied by the inverse of  $(1 - 0.9919 + 0.0192)$ , so the elasticity is approximately 0.9. This figure is a reasonable estimate of the elasticity of labour demand, and lies around the middle of the range identified in the small econometric literature. It is also of interest to note that columns 6 and 7 are inconsistent with the hypothesis that unions have their influence upon employment solely through the wage.

<sup>11</sup> We owe this point to Dan Hamermesh.

Table 5  
*Experiments with Employment Equations*

|                          | (1)               | (2)               | (3)                | (4)               | (5)               | (6)               | (7)               |
|--------------------------|-------------------|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| $E_{t-1}$                | —                 | —                 | 1.0106<br>(47.98)  | 1.0103<br>(48.33) | 1.0402<br>(42.68) | 0.9919<br>(40.99) | 0.9891<br>(40.97) |
| $E_{t-4}$                | 0.9021<br>(83.24) | 0.9032<br>(75.37) | -0.0281<br>(1.38)  | -0.0286<br>(1.44) | -0.0527<br>(2.26) | -0.0192<br>(0.84) | -0.0095<br>(0.41) |
| Union recognition        | -0.0979<br>(3.14) | —                 | -0.00005<br>(0.00) | —                 | —                 | —                 | —                 |
| Post-entry shop          | —                 | —                 | —                  | 0.0608<br>(3.17)  | —                 | —                 | —                 |
| Pre-entry shop           | —                 | —                 | —                  | -0.0046<br>(0.18) | —                 | —                 | —                 |
| Membership $\times 10^3$ | —                 | -1.4060<br>(2.96) | -0.7735<br>(2.47)  | -1.1370<br>(4.33) | -1.3040<br>(4.39) | —                 | -0.6650<br>(2.41) |
| Wage                     | —                 | —                 | —                  | —                 | —                 | -0.0253<br>(1.27) | -0.0183<br>(0.91) |
| Constant                 | 0.6096<br>(8.15)  | 0.4675<br>(5.00)  | 0.1031<br>(2.17)   | 0.1070<br>(2.27)  | 0.0758<br>(1.39)  | 0.2658<br>(2.91)  | 0.1984<br>(2.08)  |
| Adjusted R <sup>2</sup>  | 0.9322            | 0.9290            | 0.9822             | 0.9824            | 0.9807            | 0.9842            | 0.9841            |
| F                        | 80.82             | 72.63             | 298.94             | 301.14            | 222.93            | 268.02            | 266.87            |
| N                        | 1,012             | 948               | 948                | 948               | 703               | 710               | 709               |

*Notes:* 'Post and Pre-entry closed shops' (1,0) dummy variables if one or more groups of workers are covered by a post/pre-entry closed shop for any workers. 'Wage' - log of the gross weekly earnings of a typical unskilled manual workers. Column 5 relates only to establishments without any post-entry closed shop(s). All equations also include 163 industry dummies and ten regional dummies. t-statistics in parentheses.

## IV CONCLUSIONS

Although it is widely recognised that Economics needs statistically representative studies of the microeconomics of labour demand and employment, lack of data has prevented researchers from making progress on these topics.<sup>12</sup> One example of this is the current asymmetry in research on trade unions: there is a huge literature on union effects upon wages and almost no research on their consequences for employment.

Our work is an attempt to fill this lacuna. It uses a recently available random sample of approximately 1,000 British workplaces in 1984.<sup>13</sup> The *Workplace Industrial Relations Survey* is, to our knowledge, the world's first nationally representative survey series on establishments. The results in this paper suggest that trade unions depress the rate of employment growth and increase the extent of employment decline. We estimate the union employment growth differential at approximately  $-3$  percentage points per annum. This is comparable to the only other known estimate, namely, that obtained by Leonard (1991) using Californian data on manufacturing plants. There is an alternative interpretation of our results, which has been discussed above, and ought to be noted here. It is that, over a period of many years, unions reduce employment *levels*. We have not stressed this interpretation in the paper, because the lagged dependent variable is so close to unity, but it is not impossible that further research will show that this is the correct interpretation.

Traditional neoclassical labour market theory predicts that trade unions have detrimental effects on the number of jobs. The results in this paper, which should be thought of as exploratory rather than definitive, are consistent with a dynamic version of this hypothesis.

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## APPENDIX I

In a follow-up to our paper, Machin and Wadhvani (1991) argue that unions *per se* do not reduce the rate of employment growth. We disagree with their conclusions. The authors use a sample of 721 establishments drawn from the 1984 *Workplace Industrial Relations Survey*. They obtain this sample by excluding

<sup>12</sup> Further discussions are contained in Stafford (1986) and Hamermesh (1988).

<sup>13</sup> Some readers have suggested that our results may be an artefact of the special slump years of the early 1980s. In a recent paper we have estimated comparable employment equations for 1976–1980 using data from the first *Workplace Industrial Relations Survey* of 1980 (Blanchflower and Oswald, 1990). A variable for the proportion of full-time workers who were union members and a closed shop variable were included in an equation similar to that in column 4 of Table 5. The density variable had a coefficient of  $-0.00044$  and a standard error of  $0.00019$ , while the closed shop variable had a coefficient of  $0.0309$  and a standard error of  $0.0166$ . This suggests that, although the size of the effect in the early period is slightly smaller (approximately 2.5 percentage points per annum), our results are not special to the early 1980s.

Table A 1  
*WIRS<sub>2</sub>: The Machin/Wadhvani Specification of Employment Growth*

|                         | (1)                 | (2)                 | (3)                 | (4)                 | (5)                 | (6)                 |
|-------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| $\ln(N_{t-4})$          | -0.0254<br>(0.0023) | -0.0245<br>(0.0023) | -0.0241<br>(0.0026) | -0.0235<br>(0.0026) | -0.0260<br>(0.0026) | -0.2500<br>(0.0045) |
| $\ln(N_{t-1})$          | —                   | —                   | —                   | —                   | —                   | 0.2436<br>(0.0044)  |
| FOREIGN                 | —                   | —                   | —                   | —                   | -0.0154<br>(0.0084) | -0.0098<br>(0.0043) |
| DRISE                   | —                   | —                   | —                   | —                   | 0.0177<br>(0.0061)  | 0.0124<br>(0.0031)  |
| DFALL                   | —                   | —                   | —                   | —                   | -0.0102<br>(0.0096) | -0.0116<br>(0.0049) |
| ABOVE                   | —                   | —                   | —                   | —                   | 0.0152<br>(0.0057)  | 0.0011<br>(0.0029)  |
| BELOW                   | —                   | —                   | —                   | —                   | -0.0049<br>(0.0112) | -0.0166<br>(0.0057) |
| FULLCAP                 | —                   | —                   | —                   | —                   | 0.0172<br>(0.0060)  | 0.0067<br>(0.0030)  |
| LOWCAP                  | —                   | —                   | —                   | —                   | -0.0420<br>(0.0104) | -0.0177<br>(0.0053) |
| OC                      | —                   | -0.104<br>(0.0063)  | —                   | -0.0088<br>(0.0064) | 0.0008<br>(0.0114)  | 0.0087<br>(0.0058)  |
| AC                      | —                   | —                   | —                   | —                   | 0.0233<br>(0.0065)  | 0.0087<br>(0.0058)  |
| CC                      | —                   | —                   | —                   | —                   | 0.0171<br>(0.0060)  | 0.0050<br>(0.0031)  |
| UNION                   | -0.0214<br>(0.0068) | -0.0204<br>(0.0068) | -0.0216<br>(0.0074) | -0.025<br>(0.0074)  | —                   | —                   |
| UNION × OC              | —                   | —                   | —                   | —                   | -0.0342<br>(0.0123) | -0.0214<br>(0.0062) |
| UNION × (1 - OC)        | —                   | —                   | —                   | —                   | -0.0098<br>(0.0078) | -0.0036<br>(0.0040) |
| Constant                | Yes                 | Yes                 | Yes                 | Yes                 | Yes                 | Yes                 |
| Industry dummies (50)   | No                  | No                  | Yes                 | Yes                 | Yes                 | Yes                 |
| Regional dummies (10)   | No                  | No                  | Yes                 | Yes                 | Yes                 | Yes                 |
| Adjusted R <sup>2</sup> | 0.1640              | 0.1654              | 0.2406              | 0.2413              | 0.3344              | 0.8272              |
| N                       | 1,012               | 1,012               | 1,012               | 1,012               | 1,012               | 1,012               |
| F                       | 100.19              | 67.78               | 6.523               | 6.4509              | 8.0900              | 70.1200             |

any case in which a variable has a missing value, whether or not that variable was included in their employment equations. This unnecessarily reduces their sample size. In an attempt to check the findings, we re-estimated the authors' equations using the maximum feasible size of sample (excluding only those cases with missing values to the variables used). After necessary exclusions we obtained a data set with information on 1,012 private sector establishments.

Table A 1 re-estimates the Machin-Wadhvani equations on our larger sample but using their definitions and specifications from the latest version that we have seen.<sup>14</sup> Although the details of the authors' arguments have varied slightly in different drafts, the gist is that an interaction term between union recognition and the absence of 'organisational change',  $UNION \times (1 - OC)$ , is statistically insignificant. The first point to make is that, as in column 2,  $OC$  is statistically insignificant when entered alongside the  $UNION$  variable (which remains significant). This is a weak base on which to build an argument about an interaction effect. Even if it were true that  $UNION \times (1 - OC)$  were insignificant, it is not clear to us that this would imply that unions have no detrimental employment effects. We believe that the authors' organisational change variable captures part of the transmission mechanism from unionism to employment, so that their logic is compatible with ours. Here, however, we simply try to argue that the authors' empirical claim is not correct.

Table A 1, column 5, shows that, although the  $UNION \times (1 - OC)$  variable has a negative sign, it is insignificant at conventional levels of significance. This is Machin-Wadhvani's crucial result. The definitions of the two crucial variables are:  $UNION$ , which is a dummy variable for union recognition, and  $OC$ , which is a dummy variable for organisational change (establishments in which the questionnaire respondent said that there had been substantial changes in work organisation not involving new plant). Hence the interaction terms  $UNION \times OC$  and  $UNION \times (1 - OC)$  are variables capturing, respectively, two different situations. The first is where a plant had both a recognised union and some organisational change. The second is where an establishment had a recognised union but no organisational change.

The authors' critique rests upon the fact that an interaction term between unionism and  $(1 - OC)$  is not statistically significant. Table A 2 challenges their empirical claim. Rather than use a simple union recognition dummy, we replace it with a measure of union density (which gave our strong results in the paper). As before, the coefficient on the interaction between unionism and organisational change (now called  $DENSITY \times OC$ ) is bigger in absolute terms than that on unionism and no-organisational change. But now it appears unwise to draw the judgment that the interaction  $DENSITY \times (1 - OC)$  has no effect on employment growth.

<sup>14</sup> We do not comment here about the instrumental variable (IV) estimates obtained by Machin and Wadhvani (1990). This is not because we can be sure there is no simultaneity at work in these data. It is because (i) early versions of Machin-Wadhvani's critique made no mention of instrumenting, (ii) we do not believe there are convincing instruments for unionism, (iii) unless OLS could produce some evidence on its own we would not be persuaded by IV estimation, (iv) we have not seen the equations that Machin-Wadhvani use to generate the instruments (they have not provided us with their programs or data), so we are unable to comment upon their IV results.



Table A 2  
*Additional Specifications: WIRS<sub>2</sub>*

|                         | (1)                | (2)                | (3)                | (4)                 |
|-------------------------|--------------------|--------------------|--------------------|---------------------|
| $\ln(N_{t-4})$          | -0.0231 (0.0029)   | -0.2559 (0.0048)   | -0.0266 (0.0028)   | -0.2477 (0.0045)    |
| $\ln(N_{t-1})$          | —                  | 0.2522 (0.0049)    | —                  | 0.2423 (0.0047)     |
| FOREIGN                 | —                  | —                  | -0.0162 (0.0087)   | -0.0066 (0.0043)    |
| DRISE                   | —                  | —                  | 0.0180 (0.0065)    | 0.0142 (0.0032)     |
| DFALL                   | —                  | —                  | -0.0102 (0.0100)   | -0.0124 (0.0050)    |
| ABOVE                   | —                  | —                  | 0.0163 (0.0060)    | 0.0003 (0.0030)     |
| BELOW                   | —                  | —                  | -0.0060 (0.0118)   | -0.0144 (0.0059)    |
| FULLCAP                 | —                  | —                  | 0.0162 (0.0063)    | 0.0074 (0.0031)     |
| LOWCAP                  | —                  | —                  | -0.0426 (0.0109)   | -0.0194 (0.0054)    |
| UNEMP                   | —                  | —                  | 0.0000 (0.0182)    | -0.0036 (0.0090)    |
| OC                      | —                  | —                  | -0.0057 (0.0106)   | 0.0003 (0.0052)     |
| AC                      | —                  | —                  | 0.0261 (0.0068)    | 0.0109 (0.0034)     |
| CC                      | —                  | —                  | 0.0175 (0.0064)    | 0.0039 (0.0032)     |
| DENSITY × OC            | -0.00044 (0.00014) | -0.00023 (0.00007) | -0.00039 (0.00016) | -0.00024 (0.00008)  |
| DENSITY × (1 - OC)      | -0.00025 (0.00012) | -0.00018 (0.00006) | -0.00016 (0.00012) | -0.00013 (0.000059) |
| Constant                | Yes                | Yes                | Yes                | Yes                 |
| Industry dummies (50)   | Yes                | Yes                | Yes                | Yes                 |
| Regional dummies (10)   | Yes                | Yes                | Yes                | Yes                 |
| Adjusted R <sup>2</sup> | 0.1944             | 0.7972             | 0.2871             | 0.8259              |
| N                       | 948                | 948                | 928                | 928                 |

Notes: Dependent and independent variables as defined in Machin and Wadhvani (1991). Base — all private sector establishments in 1984 *Workplace Industrial Relations Survey*. Standard errors in parentheses.

The most complete specification is that in column 4 of Table A 2. This has a coefficient on the second interaction term of  $-0.00013$ , with a standard error of  $0.00006$ . In other words, we can reject the null of zero at the usual 5% level. One objection which should be noted is that in column 3 the t-statistic on  $DENSITY \times (1 - OC)$  is only approximately 1.3. Although this will be thought by some to be a weakness, it is clear that the coefficient in this case is very similar to that in columns 2 or 4. Moreover, column 4's inclusion of the one year lagged level of employment is supported by the data (it has a t-statistic of over 50), so column 3 would be a weak reed upon which to base the claim that unions do not affect the rate of employment change. Our own judgment is that the true effect of trade unionism can only be gleaned by studying an equation without most of the variables in Table A 1, such as that in column 2 of Table A 2. But that is not necessary for our critique.

These results suggest that Machin and Wadhvani's results are misleading. Table A 3 gets the same conclusion by splitting the data into samples which did and did not have organisational change. Tables A 2 and A 3 provide what seems to us to be convincing evidence that the Machin-Wadhvani conclusion is incorrect.

As a further check, we examined the authors' claim that there is no significant correlation between unionism and employment growth in a sub-sample of the large establishments. We could not verify this conclusion. Table A 4, column 4, shows that density enters significantly in an employment growth equation estimated only on a sub-sample of large establishments.

Further discussion of the Machin-Wadhvani thesis is provided in Blanchflower and Oswald (1990).

#### APPENDIX 2

The definitions of the establishment-level variables are given below. It should be noted that WIRS2 is not a panel, and thus all variables except employment are defined at the date of the survey, 1984.

*Demand up.* A dummy variable for establishments reporting that 'the value of sales of the main products or services' had been rising over the previous 12 months. Mean = 0.58.

*Demand down.* An equivalent dummy variable for sales falling over the previous 12 months. Mean = 0.10.

*Capacity high.* A dummy variable for establishments reporting that they were working 'at full capacity'. Mean = 0.51.

*Capacity low.* An equivalent dummy variable for establishments working 'considerably below full capacity'. Mean = 0.09.

*Financial performance.* A variable created from the question 'How would you assess the financial performance of this establishment compared with other establishments/firms in the same industry?', where answers were by a fivefold ordering from 'a lot better than average' down to 'a lot below average'. The single variable Financial Performance used the cardinality restriction +2, +1, 0, -1, -2 for the five answers. Mean = 0.53.

Table A 3  
Subsamples by Organisational Change: WIRS2

|                         | Plants with OC     |                    | Plants without OC  |                    |
|-------------------------|--------------------|--------------------|--------------------|--------------------|
|                         | (1)                | (2)                | (3)                | (4)                |
| $\ln(N_{t-4})$          | -0.0154 (0.0049)   | -0.2523 (0.0089)   | -0.02282 (0.0037)  | -0.2556 (0.0059)   |
| $\ln(N_{t-1})$          | —                  | 0.2514 (0.0090)    | —                  | 0.2506 (0.0062)    |
| DENSITY                 | -0.00059 (0.00021) | -0.00033 (0.00011) | -0.00020 (0.00014) | -0.00014 (0.00007) |
| Constant                | Yes                | Yes                | Yes                | Yes                |
| Industry dummies (50)   | Yes                | Yes                | Yes                | Yes                |
| Regional dummies (10)   | Yes                | Yes                | Yes                | Yes                |
| Adjusted R <sup>2</sup> | 0.2364             | 0.7917             | 0.1357             | 0.7821             |
| N                       | 343                | 343                | 605                | 605                |

Notes: Dependent and independent variables as defined in Machin and Wadhvani (1990). Base - all private sector establishments in 1984 Workplace Industrial Relations Survey. Standard errors in parentheses.

Table A 4  
Subsamples by size: WIRS2

|                         | < 100 Workers      |                    | ≥ 100 Workers      |                    | < 200 Workers      |                    | ≥ 200 Workers      |                    |
|-------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                         | (1)                | (2)                | (3)                | (4)                | (5)                | (6)                | (7)                | (8)                |
| $\ln(N_{t-4})$          | -0.2615 (0.0072)   | -0.2547 (0.0074)   | -0.2581 (0.0055)   | -0.2597 (0.0100)   | -0.2478 (0.0057)   | -0.2568 (0.0097)   | -0.00034 (0.00010) | -0.00034 (0.00010) |
| $\ln(N_{t-1})$          | 0.2536 (0.0073)    | 0.2517 (0.0072)    | 0.2478 (0.0057)    | 0.2568 (0.0097)    | -0.00006 (0.00007) | -0.00034 (0.00010) | -0.00034 (0.00010) |                    |
| DENSITY                 | -0.00077 (0.00008) | -0.00025 (0.00008) | -0.00006 (0.00007) | -0.00006 (0.00007) | Yes                | Yes                | Yes                | Yes                |
| Constant                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                |
| Industry dummies (50)   | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                |
| Regional dummies (10)   | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                |
| Adjusted R <sup>2</sup> | 0.2364             | 0.7223             | 0.8394             | 0.6855             | 0.8394             | 0.6855             | 0.8394             | 0.6855             |
| N                       | 340                | 608                | 597                | 451                | 597                | 451                | 597                | 451                |

Notes: Dependent and independent variables as defined in Machin and Wadhvani (1991). Base - all private sector establishments in 1984 Workplace Industrial Relations Survey. Establishment size calculated using 1980 employment. Standard errors in parentheses.

*Single product.* A dummy variable for establishments reporting that their output was 'concentrated on one product or service'. Mean = 0.41.

*Head office.* A dummy variable for establishments reporting that their establishment was 'the head office of (the) organisation or a similar administrative office that does not itself engage in making or selling goods or providing services'. Mean = 0.12.

*Union recognition.* A dummy variable for establishments reporting that there were trade unions 'recognised by management for negotiating pay and conditions for any sections of the workforce'. Mean = 0.48.

*Union density.* The value, at the establishment, of the ratio of union members to employees. Mean = 0.42.

*Wage.* The natural logarithm of the gross weekly earnings of a typical unskilled manual employee. Estimates obtained from grouped earnings data using midpoints. Mean = 4.38.

*Employment.* 1984, mean = 97.4; 1983, mean = 98.5; 1980, mean = 114.3.

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