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UNION DENSITY AND INDUSTRY OUTPUT, DYNAMIC AND LONG RUN RESPONSES: THE CASE OF THE AUSTRALIAN BUILDING AND CONSTRUCTION INDUSTRY

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This paper examines the effect on industry output of union density both conceptually and empirically in the case of the Australian Building and Construction industry. The classical view of the effects of a heavily unionised industry is that by exhibiting some market power, unions are able to extract above normal rents and cause industrial disruption, which is reflected in lower industry employment and higher wages. More contemporary beliefs describing the effect of unions concentrates on issues related to the external information benefits provided by union movements. By voicing information related to exit, it is argued that the resulting lower labour turnover and other related costs dominate possible higher wage and lower employment outcomes supposedly generated by heavily unionised sectors. Empirical evidence from Australia in the case of the heavily unionised Building and Construction industry, does not support the classical view that higher union density inhibits the output performance of the industry in the long run. The estimates also reveal a quick path to long run equilibrium.
1. INTRODUCTION

The classical literature argues that more intense union involvement in an industry, by introducing monopoly power on the supply-side of the labour market, has the effect of restricting employment and allowing higher wages than would be the case under the competitive outcome (see for instance, Friedman & Friedman 1962, pp. 123-5 and the discussions of Bok & Dunlop 1970, pp. 260-1 or Kerr 1957). In addition, by pursuing what is perceived (by employers) to be above-normal work conditions the possible industrial disputation which follows is costly to the industry causing loss in output and declining profits. However, more recent literature in this area including Hirschman (1970), Clark (1984), Freedman and Medoff (1984), Hirsch and Link (1984), Hirsch (1987), argue that the classical model neglects to incorporate some of the information-related benefits which union movements provide, such as those benefits which stem from exit and voice behaviour. Such behaviour, to be elaborated on further in section 2, includes the ability of a union to provide cost savings for the firm by restricting labour turnover, and by disseminating information on work-related issues such as conditions, specific job tasks, workplace hazards, and more productive work practices, in a coherent, centralised, and organised way. By including such behavioural advantages of unions in an analysis of union effects, the benefits to workplace productivity may dominate the obvious wage, employment and industrial disputation costs, thus allowing unions to be a net advantage to industry.

In order to provide evidence of the connection between union density and industrial performance, we conduct a time series, regression-based empirical investigation of the Australian Building and Construction (ABC) industry; an industry which is
characterised by heavy union involvement. The empirical investigation will take place over the early 1980’s to the mid 1990’s using quarterly data. This empirical approach is unique in the literature since it examines the time series properties of regression arguments, while also testing for the existence of long run relationships. This uniqueness stems from the fact that most papers discussing the union density/output nexus were written well before these techniques were standard. This paper is also a contribution to the literature by virtue of the arguments used to explain industry output apart from union density. Explanatory variables such as Gross Domestic Product, input prices, interest rates on loans borrowed for housing construction purposes, together, have rarely been employed in the literature with some exceptions (to be noted in Section 2). This paper also examines the short run adjustment to equilibrium by using the Engle-Granger two step procedure, another unique feature of the paper.

The remainder of this paper proceeds as follows. Section 2 presents some theoretical aspects of the relationship between union density and industry output, as well as reviewing the empirical literature. Section 3 introduces the data set and the specification used for investigation of the abovementioned relationship, while Section 4 discusses the empirical results in the context of the salient features of the ABC industry. The final section concludes the paper.

2. THEORETICAL AND EMPIRICAL LITERATURE REVIEW

The Theoretical Literature

In the classical literature it is argued that a competitive labour market will realise a lower wage and higher employment outcome than would be the case had the market been characterised by imperfections on the supply side, particularly in the case of labour union-induced imperfections. This also implies that the
performance of the industry will also suffer through lower output and profits. The standard reasons why this may be the case include: (i) labour union actions which shift the demand and supply curves for labour, (especially in the case of craft labour unions) for the benefit of members, (ii) cohesive labour unions may bargain directly for settlements which substantially exceed the offer of firms, and (iii) large industrial labour unions have significant relative bargaining strength. In this latter case unions are able to have collective bargains extended to cover both unionised and non-unionised sectors through the award system and by the use of pattern agreements in the enterprise bargaining sphere.

Recent models of union behaviour and their effects on industrial performance focus on the cost savings that may be achieved due to the presence of unions. Hirschman (and later Freeman and Medoff) argues that union voice behaviour can be an important source of cost saving for the firm as exit behaviour may be reduced, although it is still admitted that additional costs associated with unions exist. Characterisation of voice and exit behaviour originated with the contribution of Hirschman (1970), in which the narrow view of the classical school is broadened in order to account for voice and exit.

The concept of exit is based on the idea that each worker has a clear perception of how they are being treated in the workplace. If their perceived treatment is favourable, that is, their wages and working conditions are, presumably, at least comparable to their next best alternative employment, the worker will remain with the firm. By remaining, this is a reflection of the satisfaction of a worker with his or her employer, which is information that is quickly disseminated to other employees, thus the firm obtains a reputation of prioritising the welfare of workers. Conversely, a worker who believes they are receiving a relatively unfair deal is reflected in him or her leaving the firm. The firm's reputation is
tarnished in the eyes of both incumbent and prospective employees. However, this is not the only cost borne by the firm. When an employee leaves, the employer suffers pecuniarily by virtue of labour turnover and related costs such as recruiting new employees, and the (sunk) loss of employees which carry skills and training financed by the firm.

The concept of *voice* follows directly from the notion of exit. As the name suggests, voice represents the preferences of employees which are often directed through formal representative bodies (usually unions) or through established grievance procedures. By allowing the employer advanced knowledge of the views of employees before they exit, the firm may be able to remedy wages and conditions sufficiently to avoid exit, thus saving employers from the associated exit costs. However, exit costs are not the only costs which can be manifested in the perceived unfair treatment of workers; industrial disputes, shirking, poor quality control, lethargy, and pilferage may also be a reflection of mistreatment. By providing cost savings for the firm as a result of avoiding unnecessary strike activity, exit and the rest, the union is able to improve profit, output and productivity performances which may possibly dominate the increase in costs likely to flow from higher wage demands.

Voice and exit do not exhaust the potential benefits to employers of unions. Management may use unions as a focal point through which all employees can be informed of changes to the employment relationship. Unions will also discipline workers if individuals or groups try to break from the union-management deal. Additionally, by acting as a representative of employees, unions are able to group the negotiations of all workers into one process, rather than staggering individual wage claims within the firm or enterprise.
The aforementioned theoretical analysis invites an empirical investigation of the effects of strong unions on industrial performance. With most union/industrial performance analyses having been undertaken in the US, three approaches appear to be most favoured. Although the following is a far from exhaustive detailing of all studies in the area, we believe that major strands of research and results have been covered in the following.

The first approach is an aggregate study of all manufacturing establishments (see for instance, Brown & Medoff 1978). This method appears to be the least favoured, perhaps due to the indiscriminate way in which it handles aggregated data from what are essentially heterogeneous data collection points. Stepping away from that fundamentally macro approach, a more specific and popular method of investigation is employed which involves industry-specific data. Addison and Hirsch (1989) refer to studies based on this methodology as firm/business econometric analyses (for representative examples, see Clark 1984; Hirsch & Connolly 1987; and Connolly, Hirsch & Hirschey 1986). These are by far the most prevalent forms of study into the union effect/firm performance phenomena. The least used format for investigation has been the specific case study based on a single industry. Clark’s (1980a, 1980b) studies into the cement industry being an exception rather than a rule. Mandelstamm writing in 1965 employed a localised industry study, although this cannot be considered a forerunner to the investigations of the 1970’s, 1980’s and 1990’s due to its non-reliance on a production or cost function approach. Allen (1984, 1986) similarly has concentrated his study on a specific industry, and it is perhaps at this level that the greatest recognition of the problems associated with aggregation have occurred. This follows from the fact that at the level of an industry specific study, particular contextual variables associated with a selected work, economic and
industrial relations culture can be more readily identified.

Productivity and profitability have been the most celebrated measure of firm performance of late, with few investigations dealing specifically with the union effect on output. However since output is an indicator of industry/firm performance, a comparison of results, if not methodologies is a valid undertaking.

Turning to the productivity measure of firm performance, Allen (1984, 1986), Mandelstamm (1965), Clark (1980a; 1980b), Brown and Medoff (1978) and Freeman and Medoff (1984) all found a positive union influence on productivity. Running counter to these positive results and not previously cited are the outcomes presented by Connerton, Freeman and Medoff (1983), Metcalf (1988), Edwards (1987), Davies and Caves (1987) and Machin (1987), with Machin concluding that unions can have both positive and negative results depending upon the circumstances (for a critical examination of the latter four, see Nolan & Marginson 1990). Clearly, there is no distinct trend for all circumstances. Market conditions, industrial relations processes and 'culture', the type and location of production if not the technologies used within it, all conspire to produce environments in which no sure prediction can be made regarding the outcomes of unions. Each situation must be dealt with individually.

Shifting our focus to the profitability measure of performance, we find that Clark (1984), Hirsch and Connolly (1987), Connolly, Hirsch and Hirschey (1986) and Becker and Olson (1992) (to cite just a few of the studies in this area) have reported negative union effects on firm/industry profits. However some researchers have uncovered, if not contradictory, then at least an unsecure tether between the effects of organised labour and a firm or industry’s profit outcome. For example, Mandelstamm found there to be little effect on profits regardless of the degree of unionisation and of significance to this concept is Clark’s (1984) mature interpretation of the issue encapsulated by his statement that
"(t)he large body of evidence on the union wage effect ... is not sufficient to establish a union effect on profits" (p. 893).  

Unlike the American and British investigations into this field, Australian research is relatively underdeveloped. Considering the prevalence of union influence in Australian industry, and the commonly held perception that unions are an intransigent entity in the employment relationship which do nothing more than increase costs and reduce employment opportunities, it is somewhat odd that more research has not been undertaken.

Productivity analysis has been the area of most interest to Australian researchers. Phipps and Sheen (1994) have attempted to follow the Freeman and Medoff approach by using a production function technique applied to the Australian Workplace Industrial Relations Survey (AWIRS) data. Endeavouring to explain equilibrium output, they include supply side variables (for example, capital stock and employment), along with proxies of what constitute 'good' or 'bad' industrial relations. By including these receptive indicators the authors have attempted to counter a significant criticism of the Harvard model as identified by Turnbull (1991), with the criticism centring on the inability of the Harvard model to explain the industrial relations environment. The inclusion of these indicators is quite reasonable given that Metcalf came to the conclusion that the quality of industrial relations is probably the main determinant of productivity growth or decay, with Turnbull also conceding to this dictum when he states that "most scholars would broadly accept this proposition" (1991, p. 136). Freeman and Medoff also resolutely support this notion when they cite studies which have

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1 For a more complete summary of the international literature dealing with union effects on firm performance debate, see the tables presented in Addison and Hirsch (1989) and Freeman and Medoff (1984).
examined the link between the industrial relations climate and productivity (1984, pp. 176-9). Where this study may have the question of bias raised against it is in the failure to identify the demand side variables which are important in explaining output. Consideration of supply side variables only in explaining an output measure which is driven by both demand and supply side factors gives rise to concern over omitted variable bias in the empirical investigation.

Moving away from the classical US production function technique, Crockett et al (1992) and Drago and Wooden (1992) chose to analyse the AWIRS data through the use of the Ordered Probit estimation technique for relative productivity estimation. The weakness of this investigation is that the data used for productivity estimation is highly problematic. The data fails to accurately represent the actual productivity change in firms due to its reliance on perceptions of relative firm productivity performance and how their productivity is affected by, amongst other factors, labour market and labour usage restrictions as observed by the managers of firms. Clearly such data is open to the vagrancy's of subjective estimation, and thus any results stemming from such a measure should be treated with caution. In defence of the authors, they duly note the need for prudent interpretation of the results given the problematic nature of their data source.

Alexander and Green (1992) approach the study field from a different perspective, relying on a range of performance indicators which may be effected by an extensive agglomeration of explanatory variables, including productivity, ability of the firm to change, output quality and/or the relationships between employers and management. Using the LOGISTIC regression technique, their empirical investigation involves the employment of both qualitative endogenous and exogenous variables. Although they have findings that good communication between
management and the labour force produces improved firm performance, which is supportive of some of the US and UK evidence, the lack of a readily definable productivity measure appears to limit this study’s relevance in the broader debate on the impact of unionised labour on firm performance.

Perhaps in the Australian context one further type of investigation requires attention; the specific industry/firm or production line case study approach based on microeconomic data. Lansbury (1992) attempted a case study of the vehicle component industry, focusing on one part of the output and comparing this with a Swedish plant. Lansbury’s methodology, in part, echoes that of the Bureau of Industry Economics (BIE), (see for instance, BIE 1990; 1991) by using the international comparative case study approach. The significant benefit of such a study is that it allows for an in-depth focus on microeconomic factors, conceivably though its weakness is also its strength as macroeconomic factors are somewhat excluded from the investigation. However Lansbury does acknowledge the effects of a significant macroeconomic factor in the recession of 1991-92 on firm level performance. A positive feature of this study is that real measures of input and output (or close proxies) are used allowing for less contentious productivity analysis. The scope of the relevance of such an approach to other firms or other industries is somewhat limited, although as a more general commentary on microeconomic factors affecting output and firm performance this type of study has much to offer.

In summary, the Australian literature in this field is still in a developmental state, although this does not preclude the possibility that research outcomes can provide a valuable lesson for policy makers. All Australian studies have their problems and in essence these may be grouped into two categories. Firstly, the data from which the analysis has originated may not provide an accurate picture of the actual circumstances found at firm or
industry levels. Secondly, all important determinants of firm performance need to be included in the analysis so as to not produce any unnecessary bias. This has not always been the case in the Australian work to date. Our research aims to improve on the second of these failings by including demand side factors, while rectifying the first problem by including actual firm performance information rather than subjective managerial derived opinions.

3. ENGLE-GRANGER TWO-STEP ESTIMATION OF UNION EFFECTS

In this section we derive long run and dynamic responses of the performance of the ABC industry to shocks in union density. The estimates are undertaken using the Engle-Granger (1987) two-step procedure, which proceeds by estimating a long run static (cointegrating) regression, and then uses the vector of long run coefficient estimates to determine the dynamics of the adjustment to long run equilibrium. Prior to applying the Engle-Granger procedure we examine the stationarity properties of the data.

The Arguments to be Used

In order to examine the performance of the ABC industry we use as a proxy the level of output in that industry, or more specifically the 1984-85 constant dollar value of building work done measured in units of millions of dollars. In order to explain this performance we employ as regressors actual average weekly earnings in the ABC industry, an index (1984-85 = 100) of the price of materials used in that industry, the rental cost of capital proxied by the rate of interest levied on the borrowings of larger firms, the cost of borrowed finance for residential construction (demand-driven variable affecting the demand for housing
construction), Australian real Gross Domestic Product (current dollars), union density measured in percentage terms, the number of overtime hours worked, and the number of days lost as a result of industrial disputation.

Let us now justify the use of the above mentioned explanatory arguments. Consider a simplified model of the building and construction industry in Australia. Suppose that this industry is imperfectly competitive, consisting of a number of large firms and a number of small firms. Each firm has production technology which is described by the following general function:

\[ q_i = q_i(L, M, K), \]

where \( L \) is the total number of labour units employed by firm \( i \), \( M \) is the quantity of materials employed, and \( K \) is the quantity of capital employed. If we imagine that there are two types of labour units employed by the large and small firms, namely unionised, \( L_u \), and non-unionised, \( L_{nu} \), then the production technology becomes:

\[ q_i = q_i(L_u + L_{nu}, M, K). \]

In order to analyse the effects of union density, \( U = L_u/(L_u + L_{nu}) \) on output of the industry as a whole, \( Q \), some of the aforementioned studies, such as Freeman and Medoff (1984), concentrate solely on the production function effects of changes in \( UD \), that is, they simply examine the effects of changes in \( U \) on \( q_i \). Such studies neglect to incorporate information about demand. Let us now consider what we would expect as a typical inverse demand function in the case of the ABC industry:

\[ P = P(Q, Y, r_H), \]

where \( r_H \) is the cost of borrowing money for the purpose of purchasing building and construction output (including the purchase of a house), \( Y \) is national income and \( P \) is an index of
the price of output in the ABC industry. Consider the problem of a representative large firm (say firm i). If such a firm wishes to maximise profits the problem is:

$$\text{Max } \pi = P(q_i, q_i(L_u + L_{nu}, M, K), Y, r_H)q_i$$

$$- w(L_u + L_{nu}) - r_KK - P_mM.$$ 

where the exogenous variables of the problem are $q_i$ which is the vector of outputs of all the other firms in the industry, $w$ is the unionised and non-unionised wage rate, $r_K$ is the rental cost of capital and $P_m$ is the price of materials.

In solving this problem for the choice variables $L_u$, $L_{nu}$, $M$, and $K$ we obtain the factor demand functions (assuming solutions exist):

$$L_u = L_u(Y, r_H, w, r_K, P_m),$$

$$L_{nu} = L_{nu}(Y, r_H, w, r_K, P_m),$$

$$M = M(Y, r_H, w, r_K, P_m),$$

$$K = K(Y, r_H, w, r_K, P_m).$$

The representative firm's supply function becomes:

$$q_i = q_i(Y, r_H, w, r_K, P_m),$$

or if we aggregate across firms we obtain:

$$Q = Q(Y, r_H, w, r_K, P_m).$$

What we have not included in this analysis are industrial relations/labour productivity related factors, including the effects of union density, overtime hours worked, O and industrial disputation, I. If we augment our supply function with such factors we obtain:
This is the general form of the function employed in this study in order to explain the performance of the ABC industry. If we assume that the form of the function is linear then we obtain our industrial performance specification:

$$Q = a_0 + a_1 Y + a_2 r_H + a_3 w + a_4 r_K + a_5 P_m + a_6 U + a_7 O + a_8 I + e,$$

where $e$ is the disturbance term.

In order to estimate our industrial performance specification, the data used is quarterly and extends from September 1982 to June 1994, which is the period over which the data is available. Prior to estimating the specification, however, we need to conduct unit root tests.

**Unit Root Tests**

Dickey-Fuller tests for the existence of unit roots are presented in Table 1, where $Q$ is ABC industry output, $w$ is the level of average weekly earnings in the industry, $r_K$ is the rental cost of capital, $P_m$ is a price index of materials used in the ABC industry, $U$ is the percentage of union density in the industry, $Y$ is the level of real Australian GDP, $r_H$ is the cost of borrowing housing finance, $O$ is the number of overtime hours worked and $I$ is the number of days lost as a result of industrial disputation. The optimal lag length in the Dickey-Fuller tests is found by consulting $t$-values and the Durbin-h or Durbin-Watson statistic (to determine whether the specification from which the unit root statistic is obtained is acceptable). Our results indicate that variables are either $I(0)$ (integrated of order zero and hence stationary in levels) or $I(1)$ (integrated of order 1 and hence
stationary in first differences). This implies that a long run relationship will be present as long as the I(0) variables and the I(1) variables are cointegrated. The presence of a long run relationship will be reflected in the stationarity properties of the residual term which will be determined once the long run regression has been estimated.

Table 1
Dickey-Fuller Tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levels</th>
<th>First Difference</th>
<th>Order of Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q</td>
<td>-2.930</td>
<td>-5.455</td>
<td>I(1)</td>
</tr>
<tr>
<td>w</td>
<td>-3.045</td>
<td>-5.535</td>
<td>I(1)</td>
</tr>
<tr>
<td>rK</td>
<td>-3.512</td>
<td></td>
<td>I(0)</td>
</tr>
<tr>
<td>Pm</td>
<td>-1.233</td>
<td>-5.826</td>
<td>I(1)</td>
</tr>
<tr>
<td>U</td>
<td>-0.865</td>
<td>-6.343</td>
<td>I(1)</td>
</tr>
<tr>
<td>Y</td>
<td>-0.533</td>
<td>-6.027</td>
<td>I(1)</td>
</tr>
<tr>
<td>rH</td>
<td>-4.324</td>
<td></td>
<td>I(0)</td>
</tr>
<tr>
<td>I</td>
<td>-3.774</td>
<td></td>
<td>I(0)</td>
</tr>
<tr>
<td>O</td>
<td>-3.550</td>
<td></td>
<td>I(0)</td>
</tr>
</tbody>
</table>

Estimates of the Long Run Coefficients (b Vector)

OLS estimates of the long run cointegrating vector for ABC industry output is given in Table 2 below along with standard diagnostic measures and absolute t-values. Critical values at the

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2 The critical values are those associated with the unit root regression with constant and trend, equal to -3.50 at the 5% level (T=50), (Fuller 1976 pp. 373).
5% level are given in parentheses, where relevant, for the diagnostic statistics.

The Dickey-Fuller statistic for the existence of a cointegrating relationship is -5.469 with 5% critical value equal to -4.76 (Engle & Yoo 1987), while the cointegrating regression Durbin-Watson statistic is 1.969 with 5% critical value equal to 1.28, thus both tests support the existence of a long run relationship, and hence we are permitted to interpret the coefficient estimates as long run responses.

The results in Table 2 indicate that five out of eight variables are significant at the 5% level (6 at the 10% level) and they all, arguably, have the correct sign, where the sign associated with $r_K$ is ambiguous for the following reasons. The variable $r_K$ represents either the cost of borrowing for the purpose of purchasing capital or the return to investing residual profits in interest earning ventures. The first option will generate a negative effect on output and the second will cause a positive effect. The fact that we obtained a positive effect implies that the cost of capital effect is, perhaps, dominated by the interest earning effects. The remaining diagnostics such as the coefficient stability tests, (CUSUM and CUSUMQ), the serial correlation test, (CRDW), the test for normality, (Jarque-Bera), for heteroskedasticity, (Breusch-Pagan-Godfrey), and the general misspecification/functional form test, (RESET), reveal a healthy estimated specification from which, as a result, we can obtain accurate estimates of coefficients and tests of significance.
Table 2  
OLS Estimates of the Long Run Coefficients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Absolute T-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>45.922</td>
<td>0.1226</td>
</tr>
<tr>
<td>w</td>
<td>-1.1707</td>
<td>0.1753</td>
</tr>
<tr>
<td>$r_K$</td>
<td>142.29</td>
<td>2.253*</td>
</tr>
<tr>
<td>$r_H$</td>
<td>-96.572</td>
<td>0.9645</td>
</tr>
<tr>
<td>I</td>
<td>0.00663</td>
<td>1.769**</td>
</tr>
<tr>
<td>O</td>
<td>506.31</td>
<td>2.009*</td>
</tr>
<tr>
<td>Y</td>
<td>0.2051</td>
<td>3.501*</td>
</tr>
<tr>
<td>$P_m$</td>
<td>-121.89</td>
<td>2.423*</td>
</tr>
<tr>
<td>U</td>
<td>132.2</td>
<td>4.032*</td>
</tr>
</tbody>
</table>

* Significant at the 5% level.
** Significant at the 10% level.

$\bar{R}^2 = 0.9279$, CRDW = 1.969 (1.28), Jarque-Bera = 1.3204 (5.99)
RESET(2) = 0.0205 (4.15), Breusch-Pagan-Godfrey = 6.333 (9.488)
CUSUM and CUSUMQ statistics within boundaries.

The most important result is the coefficient estimate on union density, which significantly implies that a more densely unionised ABC industry will cause an increase in the output of that industry contrary to the classical predictions. Specifically, the coefficient indicates that a 1% rise in union density causes an increase in output by $132$ million. More generally, this result suggests that the more contemporary models of union behaviour may have some empirical validity, in that the empirical results
show that a more unionised sector causes an improvement in the economic performance of that sector.

This estimate of the relationship between union density and industry output is relatively precise for small movements in the level of union density. In the case of taking the change in union density to its extremes, for instance, examining the effect of 100% or 0% union density on ABC industry output, the estimated coefficient obtained in our specification is less useful by virtue of the fact that the extreme values are well outside the values considered by our empirical specification. As a consequence, attempts to use our model for forecasting extreme values of union density should be taken cautiously.

4. DISCUSSION

So why is there an observed positive relationship between unions and output in the building and construction industry of Australia? The following observations/explanations seek more to generate debate then to unequivocally identify the reasons behind the calculated positive relationship.

The relatively itinerant nature of employment relationships within the industry may help to explain our results. Workers move from job to job depending on the availability of work, although this does not necessarily mean that they leave the industry or are more likely to exit in comparison to employees in other industries (A.B.S. Cat. No. 6209.0, various issues of the period under investigation). Significant labour mobility (shifting between jobs before the work is completed), be it voluntary or involuntary, may have a deleterious effect on output. Thus, there is an incentive to both employers and employees to reduce the costly effect of exit. Were a union to have an impact in the reduction of labour mobility or dis-satisfaction, then it is quite conceivable that unions could have a positive effect on output.
It is therefore argued that an effective union is a regulating influence on the labour market. A 'web of rules', both procedural and substantive, help to reduce uncertainty in the minds of labour and thus lower the exit related actions of that labour. Localised (one site) sets of rules would have little effect, although with some degree of standardisation of work conditions and remuneration over many job sites, a reduction in the exit incentive would exist. The awards associated with the building and construction trades go some way to providing a standardising influence on the conditions of employment. In conclusion, regulation of the labour market on one hand may be seen as a market imperfection yet on the other, may actually aid the production process by stabilising a construction site's workforce.

Delays to construction activity would conceivably lower output for any given period. The union induced strike is an obvious source of delay, yet it is actually inclement weather that is the major disruption in building and construction activity. By contrast the use of the strike or other overt industrial action accounted for very little of the extensions to construction time. In the case of General building projects, which sees a greater proportion of unionisation than the Cottage building sector (The Royal Commission into Productivity in the Building Industry of New South Wales 1991a, pp. 23-4; 1991b, pp. 12-3), industrial action caused 8% of all building and construction delays compared to 49% for inclement weather.3 Our findings support this observed minor relationship; that there is no significant association between strike activity and output (refer to Table 2.). The question needing to be answered is "Is the strike such a destructive weapon?". We argue that strike activity, and industrial disputation in general, may indeed benefit the industry

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3 Due to space considerations the union's strict interpretation of inclement weather cannot be covered in detail here.
since without this voice (the strike), dis-satisfaction or exit takes place. Voice though, is only affective when the employer can hear it, and 'productive' dialogue between employees and employers is an indication that employee voice is being heard. Therefore to reduce both turnover and costly over-runs, it is in the interest of employers engaged in 'productive' dialogue to have matters regarding the employment contract settled before work takes place at a site. As a consequence, we argue that the negotiation of such a contract is best handled through the union which may negotiate on behalf of all workers and in turn, the union will help to enforce the agreement. Additionally, the same union will act as a part overseer of work to help ensure a timely delivery of product (output).

The much reported industrial militancy of unions in the ABC industry in the early to mid 1980's may actually have benefited the industry by forcing the parties to the negotiation table in order to secure stable workplace and industry agreements. Perhaps a shock effect has operated here (Hirschman 1970; Freeman & Medoff 1984). Reports published by the Parliament House Construction Authority and the Darling Harbour Authority suggest that improved labour output and a reduction in disputes will occur when both the employer and employee know exactly (within reason) what is each party's responsibility (Royal Commission Into Productivity in the Building Industry of New South Wales 1992 pp. 158-9). What is seen here, with the negotiation of work agreements and the adhering to them, is perhaps an indication of an employment relationship with attributes that may be explained by the somewhat nebulous expression, 'good industrial relations'. And although we do not model proxies of 'good' or for that matter 'bad' industrial relations, we tentatively make the assumption that 'good' industrial relations exist in the industry given our findings of a positive connection between unions and output. This may be the
feature that we are picking up in the results, which would be quite supportive of the notions advanced by Metcalf (1988), Turnbull (1991), Freeman and Medoff (1984), and Belman (1992) amongst others.

The influence of factors outside of the control of both employees and employers could also have contributed to the result that we have observed. The general state of the economy, which in turn affects most domestic industries is one such factor. Another possible factor may be the recent historical high rates of unemployment. They could affect the way in which employees and employers interact, with unions not so much pushing for better terms and conditions of employment as engaging in concession bargaining or at least consolidating past gains. Unions may have found it prudent to negotiate clear labour relations contracts and thus set procedural and substantive rules of employment in order to sure up support for the employment of their members on building and construction sites. This is set within a more uncertain environment for trade unions where, increasingly, employers have looked to private hiring halls and the like which may or may not use unionised labour (Underhill and Kelly 1993). This employer initiative surely places pressure on unions to not ‘rock the boat’ or provide employers with an even greater incentive to search for non-traditional (non-unionised, or non-affiliated) labour.

And finally, legislative requirements and the role of wage setting principles should not be overlooked here either, as it is quite conceivable that the influence of the Restructuring and Efficiency Principles and the Structural Efficiency Principles aided the development of greater dialogue between labour and capital throughout half of the period under observation. This in turn promoted a closer understanding of the pressures each have and are facing.

Our model did not allow for an exact explanation of why
unions improve the output performance of the industry. And we can not help but agree with Allen (1986) (even though the focus of the studies differ slightly, with Allen examining productivity and ours looking at one component of productivity), when he states that:

> even with relatively detailed data it is very difficult to identify precisely the sources of union-nonunion productivity differences.

*Allen 1986, p. 197*

Relatively detailed data did not exist for our study, so we are only left with a more speculative approach to explaining the mechanisms associated with the positive union effect.

Having never been the intention of this paper to exactly explain the employment relationship dynamics associated with our findings, the above can in no way be considered an exhaustive catalogue of reasons associated with our results. Our model sought to explain output through the use of a number of explanatory variables, and not just the union density figure. We believe that the union density variable is not just representative of the percentage of workers that are unionised, but is also an indication of a wider and more complex set of labour/capital interactions.

**Estimates of the Dynamic Response by ABC Industry Output**

In order to estimate how ABC industry output responds to exogenous shocks in the short run, we use the Engle-Granger two step procedure, the first step of this procedure already completed through the estimation of the long run regression above. This method involves estimating the following specification:

\[
\Delta Q_t = b_0 + b_1 e_{t-1} + \sum_{i=1}^{k} a_i \Delta Z_{t-i} + v_t.
\]
where $Z$ is a vector of all of the variables (both endogenous and exogenous) in the model, $e$ is the residual from the static (cointegrating) regression, and $v$ is a disturbance term satisfying the classical assumptions. The lag $k$ for the Engle-Granger dynamic specification is selected to be 2 based on using Sims' (1980) adjusted LR test, resulting in the estimated specification given in Table 3.

The important coefficient estimate is that associated with the residual term, -1.0577, which provides information about the dynamic response to equilibrium. Since the result is close to unity, this implies that there is an almost instantaneous adjustment to equilibrium in response to a shock in an exogenous variable. Thus for instance, in the case of a 1% increase in union density in period $t$, the response by the ABC industry output is to rise by $132$ million in period $t$ without any lagged response.

5. CONCLUSION

This paper has examined the effect on an industry’s performance, proxied by output, of having a heavily unionised labour force. In theory, there are two general schools of thought in terms of analysing these effects. The old school argues, correctly, that a union will push for above competitive wage demands which will drive employment lower than what would be the case under the competitive outcome, which in turn causes lower output and profits. The new school believes that this view is too narrow, neglecting important considerations associated with union groups avoiding unnecessary labour turnover, allowing cohesive, consensus-type bargaining, and transmitting important human capital-augmenting information to unionised members, thus enhancing labour productivity. An empirical investigation into the ABC industry, a relatively heavily unionised sector of the Australian economy, shows that a 1% increase in unionisation
causes a $132 million gain in long run output for that industry. The short run dynamics reveal that a shock to union density in quarter \( t \) flows through to output entirely in \( t \), with no adjustments occurring thereafter.

### Table 3
Estimates of the Dynamic Response

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<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Absolute T-Value</th>
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<tbody>
<tr>
<td>( e_{t-2} )</td>
<td>-1.0577</td>
<td>2.634</td>
</tr>
<tr>
<td>( \Delta Q_{t-1} )</td>
<td>0.10898</td>
<td>0.3585</td>
</tr>
<tr>
<td>( \Delta w_{t-1} )</td>
<td>-6.1649</td>
<td>0.7488</td>
</tr>
<tr>
<td>( \Delta r_{Ht-1} )</td>
<td>583.94</td>
<td>2.454</td>
</tr>
<tr>
<td>( \Delta r_{Kt-1} )</td>
<td>142.21</td>
<td>1.715</td>
</tr>
<tr>
<td>( \Delta I_{t-1} )</td>
<td>-0.00201</td>
<td>0.5725</td>
</tr>
<tr>
<td>( \Delta O_{t-1} )</td>
<td>-824.25</td>
<td>2.776</td>
</tr>
<tr>
<td>( \Delta U_{t-1} )</td>
<td>-105.58</td>
<td>0.2428</td>
</tr>
<tr>
<td>( \Delta Y_{t-1} )</td>
<td>0.03337</td>
<td>0.2437</td>
</tr>
<tr>
<td>( \Delta P_{mt-1} )</td>
<td>-90.405</td>
<td>0.3594</td>
</tr>
<tr>
<td>( \Delta Q_{t-2} )</td>
<td>0.2358</td>
<td>1.114</td>
</tr>
<tr>
<td>( \Delta w_{t-2} )</td>
<td>-8.9943</td>
<td>1.094</td>
</tr>
<tr>
<td>( \Delta r_{Ht-2} )</td>
<td>9.5693</td>
<td>0.0399</td>
</tr>
<tr>
<td>( \Delta r_{Kt-2} )</td>
<td>-224.87</td>
<td>2.304</td>
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<tr>
<td>( \Delta I_{t-2} )</td>
<td>-0.00016</td>
<td>0.05343</td>
</tr>
<tr>
<td>( \Delta O_{t-2} )</td>
<td>-188.33</td>
<td>0.5934</td>
</tr>
<tr>
<td>( \Delta U_{t-2} )</td>
<td>-188.99</td>
<td>0.5635</td>
</tr>
<tr>
<td>( \Delta Y_{t-2} )</td>
<td>-0.06287</td>
<td>0.4433</td>
</tr>
<tr>
<td>( \Delta P_{mt-2} )</td>
<td>206.82</td>
<td>1.001</td>
</tr>
</tbody>
</table>
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