Union Power and Australia’s Inflation Barrier, 1965:4 to 2003:3

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Abstract
This paper considers the view that trade union power played a major role in the deterioration of macroeconomic performance in Australia in the 1970s and that the subsequent decrease in trade union power has improved Australia’s macroeconomic possibilities. Using the model of a range of equilibria, it is shown that the evidence supports these views. Increases in trade union power and unemployment benefits, the latter increasing the reservation wage upon which bargained wages are based, shifted the inflation barrier to higher rates of unemployment in the 1970s. Subsequently, the decrease in trade union power has reversed this shift such that at the end of the period, in 2003:3, the inflation barrier is at a rate of unemployment of 3.1 per cent.

1. Introduction
A quarter of a century ago Max Corden (1979), blamed the interaction of trade union power with a centralised system of wage bargaining for the more than doubling of the rate of unemployment in Australia in the preceding five years. Corden argued that this interaction had caused a large increase in real wages and in the wage share and that these increases had created classical unemployment. The claim in 1979 that classical unemployment had emerged presented a break from the widespread view in the previous quarter-century that fluctuations in unemployment had been fluctuations in Keynesian unemployment. The Corden view was shared by many other economomists.1

In the period since 1979 there have been substantial changes in labour market arrangements in Australia as governments have pursued labour market reforms. These changes have been associated with a large reduction in union power in Australia, the first factor in Corden’s argument. For example union density is a standard measure of

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1 Dixon, Powell and Parmenter (1979), Higgins (1979), Holmes (1979) and Snape (1979), also argued that real wages had become a significant constraint on employment. A significant dissent from this view was put forward by Peter Sheehan and his collaborators, see Sheehan, Derody and Rosendale (1979). An important part of the Sheehan argument is that labour productivity had been reduced by the recession and that an expansion in employment caused by an increase in aggregate demand would increase labour productivity and so reduce the size of the wage share. Thus the high wage share was not a constraint on the level of employment.

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union power and it has halved, from a peak of 50.9 per cent in 1974 to 23.1 per cent in 2003. The second interacting factor in Corden’s argument has also changed in that the wage bargaining system has moved towards a more decentralised system. And yet, despite the reduction in union power and the move towards greater decentralisation in wage bargaining, the rate of unemployment has not fallen to the levels of the early 1970s. In 2003:3, the last quarter in the period of estimation in this paper, the rate of unemployment was 5.9 per cent.

The changes recommended by Corden and others in the 1970s have occurred but they have not been accompanied, at least by the early 2000s, by the expected payoff. Does this mean that their analysis of the causes of unemployment was incorrect?

The answer to this question is “yes” if one accepts the theory of the natural rate of unemployment as it is currently interpreted. A key proposition of the current interpretation of the natural rate approach is that business cycle fluctuations are best seen as fluctuations around a sustainable trend, see e.g., De Long (2000). Under this interpretation the actual rate of unemployment returns to the natural rate within a period comparable to the length of a business cycle. Given that labour market reforms have been in place for a period at least as long as a business cycle, any impact the reforms may have had on the actual rate of unemployment should already have occurred. However we observe that the current rate of unemployment is higher than it was in the early 1970s. The absence of a return to the low rates of unemployment of earlier years suggests that the interaction of increased trade union power and a centralised wage bargaining system was not responsible for the increase in unemployment of the 1970s.

The inference that in Australia the actual rate of unemployment has been roughly equal to the natural rate for at least a decade is reinforced by the constancy of inflation over that time. Under the natural rate view, an unemployment rate that is greater than the natural rate implies decreasing inflation. Because decreasing inflation has not occurred in Australia for at least a decade, under the natural rate view the actual rate of unemployment is interpreted as being roughly equal to the natural rate.

However, a negative verdict on the importance of the Corden view is not so obvious if the range of equilibrium approach is applied to the Australian labour market. Under that approach, the interaction of union power and centralised wage bargaining will affect the minimum equilibrium rate of unemployment, called $u_{min}$. Furthermore, a weak level of aggregate demand will open a gap between the actual rate of unemployment and $u_{min}$ but there will be no downward pressure on inflation. Consequently, the observation of a constant rate of inflation does not imply under the range approach that the actual rate of unemployment is equal to $u_{min}$. Thus, in contrast to the natural rate approach, it is possible that labour market reform has reduced $u_{min}$ but, due to weakness in aggregate demand, the actual rate of unemployment has not fallen in line with the decline in $u_{min}$.

A factor which may have contributed to an increase in union wage demands in the early 1970s is the rise in unemployment benefits at that time. The unemployment-benefit replacement ratio doubled in the early 1970s. The theory of wage bargaining suggests that the level of unemployment benefits will influence union wage demands because the theory determines the bargained wage as a mark-up on the reservation

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This presumes that the actual rate of unemployment does not exceed the maximum equilibrium rate, a reasonable presumption for Australia over the last four decades according to the estimates in Lye et al (2001).
wage and unemployment benefits are a component of the latter. In earlier papers, Lye et al. (2001) and Lye and McDonald (2004), we showed that unemployment benefits have a substantial effect on $u_{min}$.

The estimates of $u_{min}$ based on the unemployment-benefit replacement ratio only imply a level of $u_{min}$ at the end of the estimation period of 5.4 per cent, see Lye and McDonald (2004). This is far above the rates of unemployment achieved in the 1960s. However, this estimate does not allow for the effect of changes in union power. According to the theory of wage bargaining, union power will influence the size of the wage mark-up, that is the ratio of the bargained wage to the reservation wage, and so is an additional determinant of $u_{min}$. In this paper we expand the list of variables that may influence $u_{min}$ by including trade union density to capture the impact of changes in union power in the last 25 years.

The plan of this paper is as follows. Section 2 sets out the theory of the range model and describes the way in which union power can influence inflation-unemployment outcomes. Section 3 presents estimates of the range of unemployment for Australia based on a range model that incorporates trade union power. Section 4 discusses the current rate of $u_{min}$ calculated from the range model. Section 5 concludes the paper.

2. The Range Model and the Role of Union Power and Unemployment Benefits

In the range of equilibria model, union power influences the inflation barrier through its influence on the size of $u_{min}$. To understand the range model and this influence, consider the role of loss aversion by workers. We focus on loss aversion in wage bargaining because our empirical analysis focuses on explaining the rate of wage inflation. Bhaskar (1990), is the pioneering paper that showed how a range of equilibria can be derived from the assumption of loss aversion in wage bargaining.

Loss aversion is experienced by workers if their disutility from a vanishingly small reduction in the wage relative to the reference wage is greater by a discrete amount than their utility from a vanishingly small increase in the wage relative to the reference level. This introduces a kink into the worker’s utility function at a wage equal to the reference wage. There is a large amount of evidence that loss aversion is an important characteristic of human behaviour. The concept was introduced by Kahneman and Tversky (1979). The reference wage is a wage to which the workers’ compare their own wage when assessing its value.

In the economic theory of wage bargaining, the bargained wage, by optimising workers’ utility subject to the constraints they face, will be determined by a tangency of the workers’ net payoff with the net payoff to the firm. The net payoff to workers will, if workers are loss averse, have a kink at a wage equal to the reference wage. When there is a kink in the worker’s net payoff then a range of equilibrium values of the bargained wage emerges. This implies a range of equilibrium values of the wage mark-up. From this range of equilibrium wage mark-ups, a range of equilibrium rates of unemployment can be derived. Without a kink in the workers’ net payoff, there is

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3 Much earlier, Horne and McDonald (1984), presented a similar finding.

4 For a more general range model which includes both loss aversion in wage bargaining and customer market analysis of retail price setting see McDonald and Sibly (2005).
under usual restrictions a unique tangency and thus a unique equilibrium mark-up of the wage relative to the reservation wage.

For a precise derivation of the range of macroeconomic equilibrium from the loss-aversion kink, consider the following representation of Bhaskar’s model. The union, operating as an insider-dominated union, see McDonald (1991), bargains with the firm over wages and employment to maximise

$$ \Gamma(W) = \left[ \frac{W^{1-\beta}}{1-\beta} \left( \frac{W}{W_{REF}} \right)^{\gamma} \left( \frac{W^R}{1-\beta} \right) \left( \frac{AL^\alpha - WL^\gamma}{1-\beta} \right) \right]^{1-\gamma} $$ (1)

where $W=$real wage, $W_{REF}=$reference real wage, $W^R=$reservation real wage, $L=$employment, $AL^\alpha=$firm’s revenue function with $\alpha$ denoting the elasticity of revenue with respect to employment, $1-\beta$ is the elasticity of worker utility with respect to the real wage holding $(W/W_{REF})$ constant and $\phi=$union power parameter. The parameter $\gamma$ captures the influence on the union’s utility of the wage relative to the reference wage.\(^5\) To capture loss aversion, $\gamma = \gamma^-$ for $W < W_{REF}$ and $\gamma = \gamma^+$ for $W > W_{REF}$ where $\gamma^->\gamma^+>0$. The reservation wage is the expected income if not employed by the firm. The solution to this problem is for the wage mark-up to lie between limits given by

$$ k_{min} \leq \left[ 1 - \frac{\phi(1 - \alpha)(1 - \beta + \gamma)}{\alpha(1 - \phi)} \right]^{\gamma^-} \leq \frac{W}{W^R} \leq \left[ 1 - \frac{\phi(1 - \alpha)(1 - \beta + \gamma)}{\alpha(1 - \phi)} \right]^{\gamma^+} \leq k_{max} $$ (2)

As (2) shows, the range of equilibrium values for the wage mark-up has well defined limits.\(^6\) Within these limits, the bargained wage is determined by the reference wage. At these limits, the wage mark-up is determined by the parameters of the utility function and the revenue function and the union power parameter.

The range of equilibrium rates of unemployment can be derived from the range of equilibrium wage mark-ups in the following standard way, see e.g., McDonald (2002). Define the reservation wage as a weighted average of the wage and unemployment benefits, that is $W^R = \frac{1}{1-(1-e)u}W + (1-e)ubW$ where $e=$degree of effectiveness of the job finding process, $u=$unemployment rate (such that $\frac{1}{1-(1-e)u}=$probability of finding a job), $b=$unemployment-benefit replacement ratio and $W=$economy wide wage, determined by assuming that (2) determines wages at all firms in the economy. Then, from (2), a range of equilibrium rates of unemployment is determined by

$$ u_{min} = \frac{1 - \frac{1}{k_{min}}}{(1-b)(1-e)} \leq u^{eq} \leq \frac{1 - \frac{1}{k_{max}}}{(1-b)(1-e)} = u_{max} $$ (3)

where $u^{eq}$ denotes an equilibrium rate of unemployment.

When the rate of unemployment is at $u_{min}$, the lower limit of the range of equilibrium rates of unemployment, the wage mark-up is at its minimum equilibrium

\(^5\) As shown in McDonald (1991), this model is consistent with the median voter model of trade union bargaining.

\(^6\) This property of the range model makes it superior to hysteresis theories, which suffer from their implication that any rate of unemployment, however low, is a possible equilibrium rate.
value, determined by the parameters of the utility function, the revenue function and union power, as in (2). Rates of unemployment, below \( u^\text{min} \) would cause increasing inflation because wage bargaining would seek to establish a wage greater than the wage consistent with macroeconomic equilibrium, as implied by the derivation of (3). For rates of unemployment higher than \( u^\text{min} \), but not higher than \( u^\text{max} \), the wage mark-up is independent of the parameters of the utility function, the revenue function and union power, and it is determined instead by the reference wage and the reservation wage. The reservation wage is influenced by the rate of unemployment. Thus, within the range there are no disequilibrium pressures causing inflation to change.

As (3) shows, the theory also determines a maximum equilibrium rate of unemployment, \( u^\text{max} \). Rates of unemployment above \( u^\text{max} \) would cause decreasing inflation. For the Australian economy for the period under consideration here, the period since 1965:4, there is no evidence that an excess supply of labour has caused decreasing inflation, see Lye et al (2001). For the US economy, on the other hand, it appears that unemployment rates in excess of \( u^\text{max} \) have occurred, see Lye and McDonald (2006a).

We now consider the role in our model of a change in union power and a change in unemployment benefits. According to the wage bargaining theory, see equation (3), a change in union power would change the minimum equilibrium value of the wage mark-up, \( k^\text{min} \), and thus would change \( u^\text{min} \). For example, an increase in union power would increase the minimum equilibrium value of the wage mark-up and thus increase \( u^\text{min} \). For a given value of the wage mark-up, an increase in the unemployment-benefit replacement ratio, \( b \), would increase \( u^\text{min} \). Thus \( u^\text{min} \) is positively related to both union power and unemployment benefits. In the estimating system described in the next section, these effects are captured by the \( u^\text{min} \) relation.

3. Estimates of the range Model with Union Power

3.1 The Estimating System

To incorporate into the estimating system for the range of equilibria the channels through which wage bargaining influences \( u^\text{min} \), the \( u^\text{min} \) relation is specified as

\[
\begin{align*}
u^\text{min}_t = \alpha_0 + \alpha_1 r_1,t + \alpha_2 r_2,t
\end{align*}
\]

where \( r_1 \) = ratio of unemployment benefits to average weekly earnings and \( r_2 \) = ratio of union members to the labour force. The latter is a measure of union power.\(^5\)

For the unemployment-benefit replacement ratio we use the same series as in Lye et al (2001) and Lye and McDonald (2004), updated to 2003:3. This series is the unemployment benefit for a single person over 21 years with no dependents as a ratio of post-tax average weekly earnings for all males seasonally adjusted.

There are no data on union power and so we use union density as a proxy. Union density is the proportion of the labour force that is unionised. To some extent it

\(^5\) Throughout “increasing inflation” means that the rate of inflation is increasing, not “increased”.

\(^6\) As we discuss in our paper on the influence of incomes policies, Lye and McDonald (2004), it does seem that incomes policies are more effective when the rate of Keynesian unemployment, that is the actual rate of unemployment minus \( u^\text{min} \), is high.

\(^7\) Our specification of the \( u^\text{min} \) relation does not include allowance for the degree of centralisation in wage bargaining, which, as noted above, was part of Corden’s argument. To do so would be an interesting topic for further research.
is a direct measure of union power in that the greater is union density the less likely is competition from other workers, or from firms employing non-unionised labour, and so the greater is union power. Corden (1979), emphasised the greater clout that unions had over the Arbitration Commission in a centralised system of wage determination if union density was higher. However, union density is also an indirect measure of union power in that if union power increases and this leads to an increased wage mark-up then other workers will be encouraged, in the expectation of improving wages, to join a union. Thus, through their effect on union membership, union density captures the impact on union power of many factors, such as a change in legal arrangements, for example, the legalisation of secondary boycotts. This argument suggests that union density may be a lagging measure of union power.¹⁰

The use of union density as a proxy for union power, as defined in the bargaining model of this paper, gets support from McDonald and Suen (1992). In that paper, the wage bargaining model was used to measure union power over the period 1966 to 1988. That measure was found to be positively correlated with union density and therefore it can be inferred that union density is a measure of union power as defined by the wage bargaining model.

Figure 1 - The Policy variables driving umin and the Wage Share, Australia, 1966:3 to 2003:3

Union density increased in the early 1970s and then decreased, see figure 1. This movement in union density over time appears to reflect general perceptions about the evolution of union power in Australia. As noted in the Introduction, in the 1970s the perception of increased union power was inferred by some to be supported by the increase in real wages relative to labour productivity, or, what amounts to the same thing, the wage share. The wage share is also shown in Figure 1. Note, however, that there are marked contrasts between the evolution of the two variables. First, the wage share shows larger short-term fluctuations than union density. Second, by the end of

¹⁰ However, union density is sometimes argued to be a poor measure of union power because an increase in union power that successfully raises the relative wages in the unionised sector may be associated, if high wages reduce employment, with a decrease in the proportion of the labour force that is unionised.
the period union density has declined by much more than the wage share. These contrasts reflect the influence on the wage share of other pressures in addition to union power, notably the pressure arising from increases in the unemployment-benefit replacement ratio.\footnote{11}{The greater short term fluctuations and smaller long term decline of the wage share may reflect the tendency for the substitution of capital for labour to offset the effect on the wages share of wage push shocks.}

The estimating equation that determines inflation in the system is the short-run Phillips curve (SRPC). To incorporate into the SRPC the direct influence on wage inflation of incomes policies and the introduction of enterprise bargaining, we include in the equation for the SRPC dummy variables representing episodes of incomes policy and a variable representing the introduction and growth of enterprise bargaining.

For estimation purposes, the SRPC is developed in the following way. The specification of the SRPC is based on Gruen, Pagan and Thompson (1999), the approach used in our earlier papers.

Define the basic SRPC as

\[ \Delta_4 \ln ULC_t = \Delta_4 \ln P_t + a_2 (u_t - u^\text{min}) + a_3 s_{t-1} \]  

where \( ULC \) is unit labour costs (defined as wages per person employed divided by non-farm GDP per person), \( P \) is the expected price level, \( u^\text{min} \) is the minimum equilibrium rate of unemployment, \( s_{t-1} (= \Delta u_{t-1}) \) is the labour market speed limit variable (measuring the change in activity) and \( \Delta_4 \) is the four-quarter change. ULC incorporates the impact of increasing labour productivity on wages. The coefficient \( a_2 \), we call the unemployment-level effect. Note that the change in the expected price level enters with a coefficient set to unity, in keeping with Australian research on the Phillips curve, see McDonald (2002).

The change in the expected price level is determined by a mixture of backward- and forward-looking components according to

\[ \Delta_4 \ln P^*_t = (1 - a_1) \Delta_4 \ln P_{t-1} + a_1 \Delta P^*_t \]  

where \( P \) is the CPI (underlying measure) and \( P^* \) is the forward-looking component of the expected price level based on inferences from interest rates (that is \( \Delta P^* \) is the difference between the world interest rate and the Australian 10 year bond rate). Substituting (6) into (5) and rearranging gives

\[ \Delta_4 \ln ULC_t - \Delta_4 \ln P_{t-1} = a_1 (\Delta P^*_t - \Delta_4 \ln P_{t-1}) + a_2 (u_t - u^*) + a_3 s_{t-1} \]  

For estimation purposes the right-hand-side of (7) is augmented in two ways. First, in order to capture persistence effects, we include the lagged dependent variable, \( \Delta_4 \ln ULC_{t-1} \), and, second, in order to capture differences in the behaviour of inflation at quarterly and annual frequencies, we include the lagged change in quarterly rates of change in ULC, \( \Delta \ln ULC_{t-1} - \Delta \ln ULC_{t-4} \).

The range model implies that the size of the unemployment level effect, that is the slope of the SRPC, is different in the peak, that is at low rates of unemployment,
from its size in the range, that is at high rates of unemployment.\textsuperscript{12} In the peak the unemployment level effect is negative. In the range the unemployment level effect is zero. To allow for this we define two SRPC’s, one for the peak and one for the range. This is done by defining $X^P$ and $X^R$ as $(\Delta \ln \text{ULC}_t - \Delta \ln P_t)$ when the economy is in the peak (P), or range (R). The two regimes are combined according to

$$\Delta \ln \text{ULC}_t - \Delta \ln P_t = \pi^P_t \cdot X^P_t + \pi^R_t \cdot X^R_t$$  \hspace{1cm} (8)$$

where $\pi^P_t$ and $\pi^R_t$ are the dummy variables determining whether the economy is in the peak state or the range state respectively. The dummy variables $\pi^P_t$ and $\pi^R_t$ are determined by the difference between the actual rate of unemployment and $u_{t,min}$ according to the logistic relations

$$\pi^P_t = \frac{1}{1 + \exp(-\gamma(u_t-u_{t,min}))}$$  \hspace{1cm} (9)$$

$$\pi^R_t = 1 - \pi^P_t$$  \hspace{1cm} (10)$$

$X^P$ and $X^R$ are determined by their respective SRPC’s based on (5) and $u_{t,min}$ is determined by (4). In addition, following Lye and McDonald (2004), the specification of the SRPC’s includes variables to allow for the direct effects on inflation of incomes polices and enterprise bargaining on inflation. This yields the following equations for the SRPC’s.

$$X_t = a_1^i (\Delta \ln P^*_t - \Delta \ln P_{t-1}) + a_2^i (u_t - u_{t,min}) + a_3^i s_{t-1} + a_4^i (\Delta \ln \text{ULC}_{t-1} - \Delta \ln P_{t-2}) + a_5^i (\Delta \ln \text{ULC}_{t-4}) + \sum_{j \in J} a_{ij} l^j_i + \nu_i$$  \hspace{1cm} \text{for } i=P, R \hspace{1cm} (11)$$

$I$ is the set of incomes policy dummies and the proportion of employees covered by enterprise bargaining agreements and $J_i$, $i=P, R$, is the set of subscripts that denote those incomes policy and enterprise bargaining variables that are in operation when the economy is in the peak or range respectively. The $\nu_i$, $i=P, R$, are error terms.

### 3.1.1 Some Interpretive Comments

The model explains the inflation rate of unit labour costs relative to price inflation. It is useful to investigate this relationship more closely by considering a simplification of the SRPC. We set the price inflation terms to a common rate, that is $\Delta \ln P_{t-1} = \Delta \ln P_{t-2} = \Delta P^*_t = p_t$; we set the change in quarterly ULC inflation to zero, that is $\Delta \ln \text{ULC}_{t-1} - \Delta \ln \text{ULC}_{t-4} = 0$; and we denote the effect of the relevant incomes policy variables by $\beta Z_t$. If we drop the regime superscripts, equation (11) can now be rewritten as

$$(1-a_4^i) (\Delta \ln \text{ULC}_{t-p_t}) = a_2^i (u_t - u_{t,min}) + a_3^i \Delta u_{t-1} + \beta Z_t$$  \hspace{1cm} (12)$$

\text{12} As noted above, there is no evidence that a trough regime, although a theoretical possibility according to the model, has existed in Australia over the period of this study and so the possibility of a trough regime is not included in the estimation in this paper.
Equation (12) makes clear that the model is explaining deviations of the ULC inflation rate from the various price inflation rates. In the event that the coefficient on labour market pressure, as measured by \( u_t - u_{\text{min}} \), is zero, as it is in the range, then the effects of the labour market speed limit and the incomes policy variables would be to cause temporary deviations of ULC inflation from price inflation. These temporary deviations would be permanent if their impact effects fed through to price inflation. For example, a successful phase of incomes policy would lower ULC inflation in relation to price inflation and this could feed through to cause lower price inflation later. The lower price inflation would then cause permanently lower ULC inflation. (Specifying this channel and incorporating it into the estimating system is beyond the scope of this paper. In the estimation, price inflation is treated as exogenous to the model.)

The existence, that is the size and location, of the two regimes, peak and range, can be inferred from the estimates of \( \alpha_2 \) in the following way. If, for an interval of rates of unemployment that include \( u = u_{\text{min}} \), the estimate of \( \alpha_2 \) is negative then there is a unique equilibrium rate of unemployment within that interval and that rate is equal to \( u_{\text{min}} \). In Lye et al (2001) we found for the Australian economy that this was the case for the interval of rates of unemployment from zero to the rate equal to \( u_{\text{min}} \). This interval of unemployment rates was called the peak. If, for an interval of rates of unemployment that include \( u = u_{\text{min}} \), the estimate of \( \alpha_2 \) is zero then any rate of unemployment within that interval is an equilibrium rate of unemployment. In Lye et al (2001), we found for the Australian economy that this was the case for the interval of rates of unemployment from \( u_{\text{min}} \) to the highest rate observed in the data period. This interval of unemployment rates was called the range of equilibria.

Given the dominant role of the labour market in our model, our inference about the existence of peak and range regimes can be made in the way described above even although we treat the rate of CPI inflation as an exogenous variable. The dominant role of the labour market follows from the fact that labour is a non-produced factor of production. Consider capital, by way of contrast. If output were constrained by a shortage of capital then there may be upward pressure on the CPI through product prices but such pressure will be temporary and the pressure will cease when the capital stock has been augmented by investment.\(^{13}\) The small-open economy nature of Australia implies that capital adjustment will be particularly quick.

### 3.2 Estimates for Australia

Table 1 reports estimates for Australia of the range model, as described by equations (4) to (11). The estimates are for the period 1965:4 to 2003:3. The database used for the regression of the range model reported in table 1 is an updated version of the data used in Lye and McDonald (2004) and a variable for trade union density, from ABS 6310.0, as the measure of union power.\(^{14}\)

The estimates in table 1 support the range model. For rates of unemployment above \( u_{\text{min}} \) the unemployment-level effect is insignificantly different from zero with a

\(^{13}\) The labour force can be augmented by immigration but, compared with the capital stock, this is limited. The labour force can also be augmented by a higher fertility rate, but again, compared with capital, this augmentation is limited.

\(^{14}\) The data are available at [http://www.economics.unimelb.edu.au/staffprofile/imcdonald/equilibria.htm](http://www.economics.unimelb.edu.au/staffprofile/imcdonald/equilibria.htm)
p-value of 0.286. Furthermore, the coefficient estimate is very small, indeed only one
ninth of the absolute value for the unemployment-level effect in the peak.

The small size of the coefficient estimate and its insignificance imply that
there is no downward pressure on ULC inflation for rates of unemployment above
$u^{\text{min}}$. Therefore these rates of unemployment constitute a range of equilibria.\(^{15}\)

Table 1 - Estimate of the Range Model for Australia, 1965:3 to 2003:3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>t-statistic</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$u^{\text{min}}$ Constant</td>
<td>**-6.849</td>
<td>-2.338</td>
<td>0.003</td>
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<tr>
<td>Unemployment benefit</td>
<td>** 0.267</td>
<td>10.270</td>
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<td>Union density</td>
<td>** 0.114</td>
<td>2.409</td>
<td>0.016</td>
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<tr>
<td>Peak Expected inflation</td>
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<td>1.508</td>
<td>0.132</td>
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<tr>
<td>Unemployment level</td>
<td>**-0.811</td>
<td>-3.431</td>
<td>0.001</td>
</tr>
<tr>
<td>Labour market speed limit</td>
<td>**-2.573</td>
<td>-2.652</td>
<td>0.008</td>
</tr>
<tr>
<td>Lagged dependent variable</td>
<td>** 0.768</td>
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<tr>
<td>Quarterly inflation term</td>
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<td>3.245</td>
<td>0.001</td>
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<td>Incomes policy 75:2-76:2 (M1G)</td>
<td>0.391</td>
<td>0.232</td>
<td>0.817</td>
</tr>
<tr>
<td>76:3-78:2 (M2G)</td>
<td>-0.096</td>
<td>-0.117</td>
<td>0.907</td>
</tr>
<tr>
<td>78:3-79:3 (M3G)</td>
<td>-1.194</td>
<td>-1.325</td>
<td>0.185</td>
</tr>
<tr>
<td>79:4-81:2 (M4G)</td>
<td>0.609</td>
<td>0.491</td>
<td>0.624</td>
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<tr>
<td>Range Expected inflation</td>
<td>** 0.204</td>
<td>2.707</td>
<td>0.007</td>
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<tr>
<td>Unemployment level</td>
<td>0.091</td>
<td>1.067</td>
<td>0.286</td>
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<tr>
<td>Labour market speed limit</td>
<td>0.207</td>
<td>0.386</td>
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<tr>
<td>Lagged dependent variable</td>
<td>** 0.552</td>
<td>6.896</td>
<td>0.000</td>
</tr>
<tr>
<td>Quarterly inflation term</td>
<td>** 0.508</td>
<td>5.746</td>
<td>0.000</td>
</tr>
<tr>
<td>Incomes policy 83:1-83:2 (WP)</td>
<td>**-2.324</td>
<td>-2.279</td>
<td>0.023</td>
</tr>
<tr>
<td>83:3-85:2 (AMI)</td>
<td>**-1.352</td>
<td>-1.957</td>
<td>0.050</td>
</tr>
<tr>
<td>85:3-86:4 (AMII)</td>
<td>**-1.645</td>
<td>-2.947</td>
<td>0.003</td>
</tr>
<tr>
<td>87:1-88:2 (AMIII)</td>
<td>**-1.892</td>
<td>-3.067</td>
<td>0.002</td>
</tr>
<tr>
<td>88:3-89:2 (AMIV)</td>
<td>-0.125</td>
<td>-0.201</td>
<td>0.840</td>
</tr>
<tr>
<td>89:3-90:3 (AMV)</td>
<td>-0.714</td>
<td>-0.947</td>
<td>0.343</td>
</tr>
<tr>
<td>90:4-93:2 (AMVI)</td>
<td>**-1.710</td>
<td>-2.948</td>
<td>0.003</td>
</tr>
<tr>
<td>Enterprise bargaining 91:4-01:2</td>
<td>**-0.059</td>
<td>-1.816</td>
<td>0.069</td>
</tr>
</tbody>
</table>

Number of observations = 153, Log likelihood = -250.977, Schwarz B.I.C. = 627.715. *(***) significantly different from zero at the 90 per cent (95 per cent) level. MXG=Mark X guidelines, WP=Wages Pause, AMX=Accord Mark X.

For rates of unemployment below $u^{\text{min}}$ the unemployment-level effect is
negative and significant, p-value=0.001. This indicates that for rates of unemployment
below $u^{\text{min}}$ there is a unique equilibrium rate of unemployment, equal to $u^{\text{min}}$. At the
rate of unemployment equal to $u^{\text{min}}$ there is no tendency for inflation to be increasing.
But for rates of unemployment less than $u^{\text{min}}$, the negative value of the unemployment-
level effect implies that there would be excess demand for labour, causing increasing
ULC inflation. $u^{\text{min}}$ is the upper bound of these rates and so these rates of unemployment
can be labelled the peak and $u^{\text{min}}$ is the inflation barrier. Note that the identification of
$u^{\text{min}}$ places a lower limit on the range of equilibria. This is a contrast with estimation of
models of hysteresis, in which no such lower limit is estimated.

\(^{15}\) For completeness we note that the coefficient estimate is also of the wrong sign.
The estimates for the variables determining $u_{\text{min}}$ suggest that union power has a significant and substantial impact on $u_{\text{min}}$. The coefficient estimate of 0.114, with a $p$-value=0.016, implies that a one percentage point reduction in union density reduces $u_{\text{min}}$ by 0.114 percentage points. The unemployment-benefit replacement ratio, as in our two previous papers for Australia, has a significant and substantial effect on $u_{\text{min}}$. The coefficient estimate, 0.267, $p$-value=0.000, implies that a one percentage point reduction in the replacement ratio reduces $u_{\text{min}}$ by 0.267 percentage points.

Figure 2 shows the graph of $u_{\text{min}}$, its 95 percent confidence limits, a series labelled $u_{\text{min}}$AEP (see below) and the actual rate of unemployment. $u_{\text{min}}$ increased from two percent in the first half of the 1970s to over six percent in the second half of the 1970s. It has subsequently trended down and was 3.1 percent in 2003:3.

If we compare the actual rate of unemployment to $u_{\text{min}}$, then we can see that from 1965:4 to 1980:1 the Australian economy was in the peak regime, a period during which the actual rate of unemployment was less than $u_{\text{min}}$. In 1980:2 the Australian economy entered a range of equilibria and it has stayed in the range regime with the exception of 1989:3, in which quarter the actual rate of unemployment dropped below $u_{\text{min}}$.

![Figure 2 - The Inflation Barrier ($u_{\text{min}}$), Australia, 1965:4 to 2003:3](image)

For the first part of the data period the estimate of $u_{\text{min}}$ is well determined. In the period up to 1993:3 the 95 per cent confidence interval is less than 1.5 percentage points. After that the confidence interval increases substantially and is 4.2 percentage points at the end of the data period. The actual rate of unemployment is above the upper limit of the 95 per cent confidence interval from 1981:3 onwards, with the exception of the three quarters 1989:2 to 1989:4. From the estimates one can conclude with 95 per cent confidence that the actual rate of unemployment in Australia at the end of the estimating period exceeds the inflation barrier.

The effect of including trade union density as well as the unemployment-
The benefit replacement ratio in the variables determining $u^{\text{min}}$ can be seen by comparing the estimate of $u^{\text{min}}$ in Figure 2, with the series labelled $u^{\text{min}}$ AEP. This latter series is the estimate from Lye and McDonald (2004).\textsuperscript{16} In that estimation the $u^{\text{min}}$ relation did not include union density but only the unemployment-benefit replacement ratio. It can be seen that adding union density to the determinants of $u^{\text{min}}$ makes a substantial difference. Its inclusion increases the estimate of $u^{\text{min}}$ by between .5 and one percentage point in the later 1970s and 1980s. Thereafter, the inclusion of union density causes $u^{\text{min}}$ to decrease substantially, to be 1.9 percentage points less in 2001:1, the last quarter in the $u^{\text{min}}$ AEP series. This reflects the considerable reduction in union density, and by inference union power, by 27.8 percentage points from the peak in 1974:3.\textsuperscript{17}

The regime shift from peak to range occurs slightly later than implied by $u^{\text{min}}$ AEP. For $u^{\text{min}}$ AEP, the regime shift was in 1978:2. This is due to the generally higher levels of $u^{\text{min}}$ around that time when allowance is made for the influence of union power and for the fact that during this period $u^{\text{min}}$ is close to the actual rate of unemployment.

The estimates of $u^{\text{min}}$ support the view of Corden and others referred to in the introduction that the interaction of trade union power with the arbitration commission caused the substantial increase in the unemployment rate in the 1970s. In this interaction, the increase in unemployment benefits played the major role. In the theory of wage bargaining unemployment benefits affect bargained wages through their influence on the income prospects of those who are unemployed because of the wage outcome.\textsuperscript{18}

Furthermore, the estimates suggest that the decrease in union power since then has decreased $u^{\text{min}}$ by such a large amount that rates of unemployment comparable to those achieved in the 1960s are within the grasp of aggregate demand policy.

Table 1 shows the direct effect on inflation of centralised wage bargaining on inflation, as measured by eleven incomes policy dummies and an enterprise bargaining variable. Our estimates of the effects of incomes policy on inflation are strong and in accordance with the earlier estimates in Lye and McDonald (2004). Of the four incomes policy guidelines over the period 1975:2 to 1981:2, the Mark 3 guidelines, 1978:3 to 1979:3, have the strongest effect on reducing inflation but that effect is not significant, with a p-value of 0.185. In the estimates in Lye and McDonald (2004), the Mark 3 incomes policy guidelines did have a significant effect. The other three income policy guidelines were not significant. Note that Marks 1, 2 and 3 incomes policy guidelines were operating against the pressure of excess demand for labour, that is the economy at that time was in the peak regime, and so their lack of significance is consistent with the view that disequilibrium forces are too strong to be offset by incomes policy.

In the range period various episodes of incomes policy were successful. The results in Table 1 indicate that the Accord of the Hawke government had a strong

\textsuperscript{16} $u^{\text{min}}$ AEP is virtually identical with the $u^{\text{min}}$ series estimated in Lye et al (2001), for the period 1965:3 to 1997:4.

\textsuperscript{17} The coefficient on the unemployment-benefit replacement ratio is hardly changed by the inclusion of union density, from 0.236 in Lye and McDonald (2004), to 0.267 in this paper. The t-statistic is increased from 2.545 to 10.270.

\textsuperscript{18} Of course, job search theory also predicts that an increase in unemployment benefits would tend to increase unemployment. However, the substantial increase in long-term unemployment in the later 1970s that followed the increase in unemployment in 1974 casts doubt on the search theory explanation.
downward impact on inflation. The new estimates of the effect of the Accord are virtually identical with the estimates in Lye and McDonald (2004), and so are robust to the addition of union density into the $u^\text{min}$ equation and to the extension of the data period. Accords Mark I to Mark III, which operated from 1983:3 to 1988:2, reduced the rate of inflation by 4.9 percentage points, the same as measured by our earlier estimates. Accord Mark VI, 1990:4 to 1993:2, reduced inflation by 1.7 percentage points. Accords Mark IV and V had an insignificant effect on inflation, as in earlier estimates. So the total effect of the Accord on inflation, the sum of the significant effects, was to reduce it by 6.6 percentage points.

The Wages Pause, 1983:1 to 1983:2, had a significant effect on inflation and reduced it, according to the estimates in table 1, by 2.3 percentage points. By comparison, in Lye and McDonald (2004), the estimate of the impact of the Wages Pause was not significant (p-value=0.218).

The enterprise bargaining variable, the proportion of workers covered by enterprise bargaining agreements, has a significant downward effect on inflation. Our estimate is based on a truncated enterprise bargaining variable, truncated at 2001:2. The reason for truncating this variable is that without truncation, that is running the variable to the end of the data period, there is evidence of a non-linear effect. Specifying a linear relation for the non-truncated enterprise bargaining variable yielded an insignificant effect. Specifying a non-linear relation as a quadratic relation suggested that the effect was negative up to 2000 and then became positive. However this movement to a positive effect is probably an artefact of the quadratic form and so we truncated this effect in 2001:2. We conclude from our estimate that enterprise bargaining reduced inflation in the years when the coverage was increasing. The total effect on inflation is small, with the increase in coverage from zero in 1991:4 to 16.2 percent by 2001:2 reduced the rate of inflation by 0.96 percentage points (=16.2 times 0.059).

The $u^\text{min}$ relation reported in table 1 is robust irrespective of whether the incomes policy dummies and the enterprise bargaining variable are included or excluded. This can be seen if we compare the results in table 1, in which these variables are included, with the results in column 1 of table 2, in which these variables are excluded. As in Lye and McDonald (2004), excluding these variables does lead to a significant estimate on the unemployment-level effect when the economy is in the range, p-value=0.078, but the coefficient estimate is very small, one tenth of the estimate when the economy is in the peak, that is 0.088 compared with 0.867, and so for practical purposes the range model is supported by the regression that does not include the incomes policy dummies and the enterprise bargaining variable.20

19 This reduction in ULC relative to the CPI is about half that reported in Chapman (1990), based on several studies.

20 Table 2 also includes estimates of the $u^\text{min}$ relation using the wage share, based on National Accounts data, as a determining variable in the $u^\text{min}$ relation in the range model, instead of union density. For the wage share model, the estimates of the unemployment-level effects across regimes, not reported in table 2, continue to support the range model. In the $u^\text{wage}$ relation, the coefficient on the wage share is positive and significant. However, the coefficient in the $u^\text{wage}$ relation on the unemployment-benefit replacement rate is reduced, probably reflecting the joint influence of union power and unemployment benefits in the determination of the wage share. The path of $u^\text{wage}$ implied by these estimates has a similar pattern to the path based on union density except that it decreases more quickly, to four per cent by the late 1979’s. Given the deficiencies of the wage share, we prefer the estimates of the range model that use union density.
Table 2 - Determinants of $u^{\text{min}}$ Under Various Specifications of the Range Model

<table>
<thead>
<tr>
<th></th>
<th>Union density</th>
<th>Wage share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>incomes policy dummies excluded</td>
<td>incomes policy dummies included</td>
</tr>
<tr>
<td>Constant</td>
<td>coef: -6.258, p value: 0.002</td>
<td>coef: -6.849, p value: 0.003</td>
</tr>
<tr>
<td>Unemployment benefit</td>
<td>coef: 0.275, p value: 0.001</td>
<td>coef: 0.267, p value: 0.000</td>
</tr>
<tr>
<td>Union power</td>
<td>coef: 0.094, p value: 0.031</td>
<td>coef: 0.114, p value: 0.016</td>
</tr>
</tbody>
</table>

4. The Current Rate of $u^{\text{min}}$

The estimates of the $u^{\text{min}}$ relation suggest that at the end of the sample period, 2003:3, $u^{\text{min}}$ was 3.1 per cent, 2.8 percentage points lower than the seasonally-adjusted actual rate of unemployment in 2003:3 of 5.9 per cent. The upper limit of the 95 per cent confidence interval for $u^{\text{min}}$ in 2003:3 is 5.2 per cent, which is less than the actual rate of unemployment though only by 0.7 percentage points. This suggests, given the values of union density and the unemployment-benefit replacement ratio in 2003:3, that aggregate demand policy would be able to reduce the actual rate of unemployment to 3.1 per cent. How confident can we be of this suggestion?

Two issues can be distinguished. First, how much reliance can be placed on the estimate of $u^{\text{min}}$ for 2002:3 of 3.1 per cent? Second, could an increase in aggregate demand reduce the actual rate of unemployment to $u^{\text{min}}$? We consider these issues in turn.\(^{21}\)

In assessing the reliance of the estimate of $u^{\text{min}}$ for 2003:3, recall that the estimate of the $u^{\text{min}}$ relation is driven by the behaviour of the relevant variables up to 1980:1, when the economy was in the peak. In the subsequent period the determining variables have negligible effects on the estimate of $u^{\text{min}}$ because the unemployment-level effect was insignificantly different from zero and so the gap between actual unemployment and $u^{\text{min}}$ had a negligible effect on inflation. Consequently, our estimate of $u^{\text{min}}$ for 2003:3 is inferred on the basis of behaviour more than 20 years earlier. In the intervening period of more than 20 years many things that could affect the labour market have changed but in making our estimates of $u^{\text{min}}$ we track only changes in union density and the unemployment-benefit replacement ratio. For example, a change that may have affected $u^{\text{min}}$ over the period is the tightening of the unemployment benefit system by the implementation of ‘work for the dole’. This would be expected to have reduced $u^{\text{min}}$ for a given value of the unemployment-benefit replacement ratio. It could be argued that the tightening of the unemployment benefit system implies that in 2003:3 the true $u^{\text{min}}$ is less than the estimate of 3.1 per cent.\(^{22}\)

\(^{21}\) The estimate of $u^{\text{min}}$ and the confidence interval are robust with respect to whether the incomes policy dummies are included or not included. Estimates which exclude these dummies indicate $u^{\text{min}}$ equal to 3.5 per cent for 2003:3.

\(^{22}\) Cai and Gregory (2005), find that the change in arrangements for the disability pension in Australia led to a substantial change in the flow from unemployment benefit support to disability support, the direct effect of which also suggests a lower $u^{\text{min}}$ for a given unemployment-benefit support ratio.
With regard to union power, it is possible that the introduction of enterprise bargaining may of itself have reduced union power. However, any such effect may have been picked up by decreasing union density and so would be captured by our estimate of \( \mu_{\text{min}} \). This also applies for any other reasons that union power may have changed, such as reduced tariffs and other microeconomic reforms.

Against this reasoning that in 2003:3 the true \( \mu_{\text{min}} \) is less than our estimate, we acknowledge that our assumed linear form of the \( \mu_{\text{min}} \) relation may be incorrect. We have not investigated non-linear forms. Calmfors and Driffill (1988), found an inverted U-shaped relation between union density and wage pressure for a panel sample of OECD countries. The non-linear form that Calmfors and Driffill investigated was over a wider range of union density rates than is observed in our data period for Australia. Consequently our linear relation between \( \mu_{\text{min}} \) and union density is not inconsistent with the inverted U-shaped relation found by Calmfors and Driffill (1988). It may be that we are in effect estimating the relation along one side of the inverted U.

In the model we used to develop our estimating equations for the range of equilibria, unemployment was determined by wage bargaining. The other types of unemployment, especially unemployment due to job search and to efficiency wages, were not included. The emphasis on wage bargaining is appropriate for the focus of the paper, that is on the effect of variations in union power on unemployment in Australia. However, the decreasing importance of these factors implies that one should consider the behaviour of the other types of unemployment. Economic theory suggests that these other types of unemployment will relate positively to the unemployment-benefit replacement ratio, the same qualitative relation as for unemployment due to wage bargaining, and so their behaviour will be picked up by the \( \mu_{\text{min}} \) relation. This gives more comfort for the figure for \( \mu_{\text{min}} \) of 3.1 per cent in 2003:3.

We now turn to the second issue. There is reason to be sanguine about the possibility that aggregate demand policy can reduce the actual rate of unemployment to \( \mu_{\text{min}} \). According to our estimates, there was no labour market speed-limit effect for the period since 1980, the period during which the Australian economy has been within the range. This suggests that reductions in unemployment will not cause inflation to increase through speed-limit pressure emanating from the labour market.

In this paper we have not investigated product-market speed limits, which could put upward pressure on prices in periods when aggregate demand increased. Bottlenecks in the product market could put upward pressure on prices as aggregate demand increases. It seems that the recession of the early 1990s put downward pressure on prices and this would suggest, by symmetry, that an expansion would put upward pressure on prices. However, it may be that the effect is asymmetrical. We note that there has been little upward pressure evident on price inflation through the current expansion from 1993.

It is argued in McDonald and Sibly (2005), that an inflation target, by “locking in” the expected rate of inflation, permits a non-inflationary expansion in activity. Since 1993 an inflation target has guided the setting of monetary policy in Australia. Given that the expected rate of inflation has been ‘locked in’ by inflation targeting, it can be argued that reductions in the current rate of unemployment to \( \mu_{\text{min}} \) may be possible with no increases in inflation.
5 Conclusion

The estimates for Australia of the range model in this paper support the view of Corden and others that union activity was an important factor in the increase in unemployment in the 1970s. The increase at that time in unemployment benefits and union power, as measured by union density, made a major contribution to the rise in unemployment. According to the theory of wage bargaining, increases in either of these factors would increase the bargained wage and cause the inflation barrier, or in the terminology of the range model, $u^\text{min}$, to be positioned at a higher rate of unemployment. Our estimates suggest that the increase in these factors caused the inflation barrier to shift by 4.6 percentage points from 1970:3 to 1978:1, from a rate of unemployment of 2.5 per cent to a rate of 7.0 per cent. In causing this shift in the inflation barrier, the increase in unemployment benefits was more important than the increase in union power. The increase in the inflation barrier from 1970:3 to 1978:1 can be decomposed into 4.1 percentage points attributable to a rise in unemployment benefits and 0.5 percentage points attributable to an increase in union density.

Since the 1970’s $u^{\text{min}}$ has decreased to a level similar to the 1960s. This decrease in $u^{\text{min}}$ has been driven by a large reduction in union power. The unemployment-benefit replacement ratio is little changed from its peak value in the 1970s. Thus adding union density, the measure of union power, to the variables we include in our equation for $u^{\text{min}}$ changes the estimated pattern of $u^{\text{min}}$ over the last 20 years and reduces $u^{\text{min}}$ substantially by the end of the estimation period compared with our earlier estimates of the range model, see Lye et al (2001) and Lye and McDonald (2004). Our current estimates of $u^{\text{min}}$ suggest that quite low levels of unemployment are attainable without increasing inflation and these low levels of unemployment reflect the labour market reforms that have been implemented over the last three decades. The benefit of labour market reform is the latter-day corollary of the Corden view.

Our estimates of the range model suggest that the Australian economy has experienced Keynesian unemployment, that is the actual rate of unemployment has exceeded $u^{\text{min}}$, for the last 23 years of the data period, from 1980:2 to 2003:3. This experience, taking into account the large levels of Keynesian unemployment that persisted during this period, contradicts the natural rate view that business cycle fluctuations are best seen as fluctuations around a sustainable trend, see e.g., De Long (2000). In Lye and McDonald (2006b), we show that the range model outperforms the natural rate model.

At the end of our estimation period, 2003:3, the actual rate of unemployment is 2.8 percentage points above the actual $u^{\text{min}}$ of 3.1 per cent. Thus there is 2.8 percentage points of Keynesian unemployment. This implies that unemployment can be reduced by 2.8 percentage points before bumping into the inflation barrier, that is without creating a situation of increasing inflation. For aggregate demand policy, removing this 2.8 percentage points of Keynesian unemployment is the major challenge.

However, in our view our estimate of 3.1 per cent for $u^{\text{min}}$ in 2003:3 is biased upwards. Our estimate of $u^{\text{min}}$ does not allow for the changes in the unemployment-benefit system, such as the work for the dole scheme, that reduced the attractiveness of the unemployment benefit scheme to recipients. If we allowed for this then our estimate of the current rate of $u^{\text{min}}$ would be reduced. We argue that $u^{\text{min}}$ could be as
low as 2.5 per cent and thus an actual rate of unemployment of 2.5 per cent is within the grasp of those setting aggregate demand policy in Australia.23

References

23 Furthermore, the current practice if indexing unemployment benefits to the CPI will cause an automatic decrease in the unemployment-benefit replacement ratio if real wages trend upwards. This will cause }\textit{u}_{\text{min}} to be decreasing.


