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Labour underutilisation and the Phillips Curve

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1.   Introduction

Mitchell and Muysken (2008) demonstrate that on conceptual and empirical grounds, the OECD Job Study paradigm failed to deliver on its promise to generate full employment and enhanced skill levels. This paradigm underpinned the demise of full employment and focus by most national governments on active labour market programs, or full employability. The pursuit of full employability has been characterised by a myriad of training programs, coercive welfare-to-work policies and a withdrawal of government responsibility for ensuring enough jobs are generated to match the preferences of the labour force.

For 14 years, the supply-side emphasis on the attitudes and preparedness of workers has prevailed but labour underutilisation rates remain high. Now, with the current financial crisis beginning to spill over into real activity, labour market conditions will quickly deteriorate again.

Some 14 years after the OECD Jobs Study was released, the OECD economies on average still generate an unemployment rate of around 6 per cent (down from 7.3 per cent in 1994). The Euro area still generates an unemployment rate of around 8 per cent (down from 10.5 in 1994). Unemployment rates in the big European economies such as France and Italy have persisted at levels of 7 to 8 per cent or more since the early 1980s and in the last decade Germany has deteriorated in a similar fashion. Even the so called successful reformers (OECD, 2001) such as Australia, the Netherlands and the UK have failed to generate the low unemployment rates of the golden age period of the 1960s. Most recently, the US has experienced rapid job losses and a rising unemployment rate. Taken alone, the dynamics of OECD unemployment rates over the last decade can hardly be seen as a success of the Jobs Study approach to policy.

Compounding this malaise is the fact that the official unemployment data significantly underestimates the extent of labour market slack. Since the 1991 recession, underemployment has risen in all OECD countries. The trend towards lower official unemployment rates and rising underemployment that is common in many OECD economies belies the claim that falling unemployment is a signal of a movement towards full employment. In Australia, for example, the Centre of Full Employment and Equity (2008) estimates over 8 per cent of willing labour are underutilised in various ways (unemployment, hidden unemployment and underemployment) despite the official unemployment rate being at 4.2 per cent (as at October 2008). This is a conservative estimate given the official statistician estimates total labour underutilisation to be 9.9 per cent in October 2008 (ABS, 2008). We conclude that the period since the release of the OECD Jobs Study has seen an accelerating trend towards precarious employment (limited dismissal protection) in the form of part-time and casualised employment and the commensurate failure of economies to provide enough hours of work to match the preferences of the workforce.

However, over the same period employment growth has been relatively strong in Australia and inflation has been falling. The question arises as to why wage pressures have been relatively benign? In this paper we propose that the rise in underemployment has changed the wage setting process in the labour market and is now used by employers as a means of disciplining wages growth. We use the Australian labour market as the empirical example. Our further work will focus on other economies.

The paper is laid out as follows. Section 2 traces the rise in underemployment in Australia to the dynamics that accompanied the 1991 recession. Firms rapidly replaced
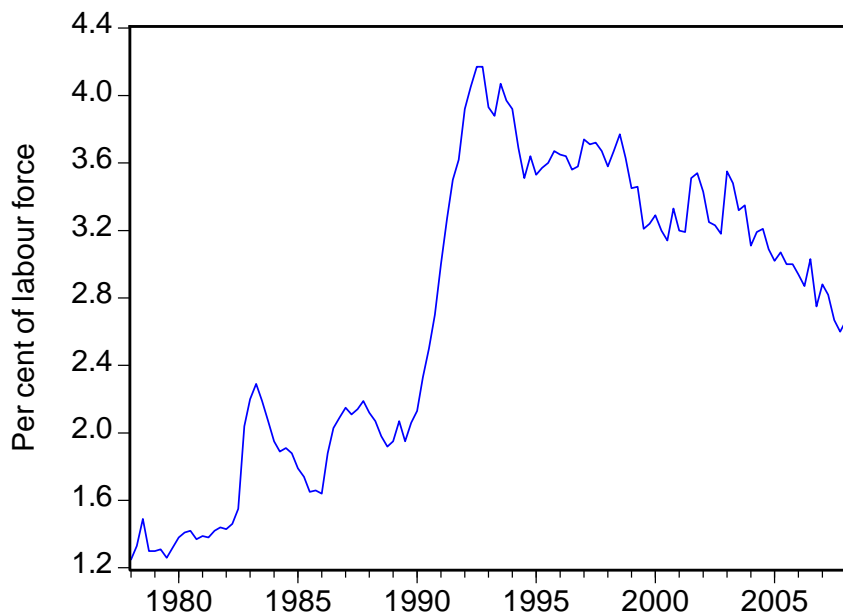
full-time jobs with fractional opportunities. Section 3 considers wage and productivity movements in Australia and finds that over the recent growth cycle, real wages have trailed behind labour productivity and hence there has been a massive redistribution of national income to profit. Further, the relation between the employment rate and real wages growth has changed dramatically over the last growth period. Compared to earlier periods, rising employment rates have very little impact on real wages growth. Section 4 develops a theoretical model grounded in labour market segmentation theory to explain these trends. Section 5 provides formal econometric evidence to support the proposition that underemployment is a significant negative influence on inflation. Concluding remarks follow.

2. The rise of underemployment in Australia

Underemployment occurs when full time workers are forced to work less than the full time working week for reasons beyond their control or when part-time workers prefer to work longer hours but are constrained by the demand-side (ILO, 2006; Mitchell and Muysken, 2008).

Figure 1 shows the evolution of underemployment in Australia since 1978. The defining event in this evolution was the major recession in 1991 which saw an acceleration of part-time work as full-time jobs were scrapped but moreover an increasing proportion of the part-time offering sub-optimal hours of work.

Figure 1 Underemployment in Australia, 1978 to 2008, per cent

Source: Centre of Full Employment and Equity Labour Market Indicators (CLMI), 2008.

Figure 2 reinforces the view that the 1991 recession was decisive in explaining the major increase in underemployment as a significant component of labour underutilisation in Australia. During the 1982 recession, as the official unemployment rate increased, underemployment rose more or less proportionately, which suggests that there was no structural shift in the "hours-quality" of part-time work during this period. The break in the relationship occurred as the 1991 recession unfolded. As the economy

3

improved slowly over the 1990s and into the current century, the relationship between the two major sources of labour underutilisation resumed its more or less proportional nature.

Figure 2 Unemployment and underemployment rates, Australia, 1978 to 2008, per cent

Source: ABS Labour Force statistics; Centre of Full Employment and Equity Labour Market Indicators.

An analysis of the behaviour of full-time and part-time work during the last two major recessions (1982 and 1991) allows us to understand these dynamics more clearly. Figure 3 presents 'butterfly' plots depicting movements in full-time and part-time employment for males and females over the 1982 and 1991 recessions. Each plot begins 4-quarters before the peaks in GDP activity, then traces the behaviour from peak to trough and then 8-quarters following the trough (dating is explained in Mitchell, 2001). The shaded areas indicate the period between peak and trough in each of the cycles. The employment series are index numbers with the base coinciding with the peak GDP quarter.
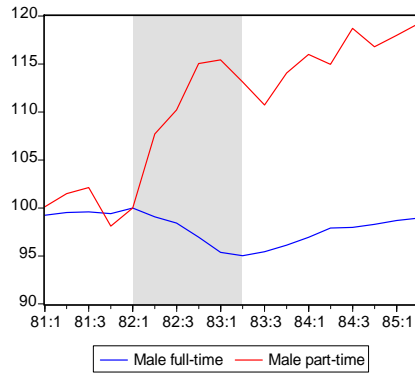
Several points can be made. First, during both recessions there was a switch from full-time work to part-time work for both males and females resulting in a greater proportion of workers in short-duration jobs. This is accentuated for males.

Second, male employment adjustments appeared to begin with part-time work increasing rapidly in the last quarter of the expansion and accompanied by a slowing, then substantial decline in full-time employment. In the 1991 recession, a similar pattern was evident. For females, the slowdown in part-time employment growth in late 1981 appeared to lead the decline in full-time work. Both pre-dated the contraction. By the second recession, the patterns were similar to males.
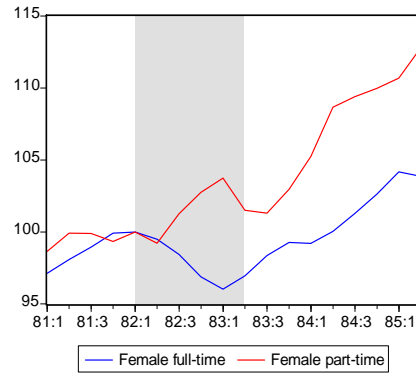
Third, the behaviour of full-time employment in the recovery was different for the two recessions. The passing of the trough in 1983 was marked by an immediate return to full-time employment growth not dissimilar to the rates in the late part of the upswing. This is in sharp contrast to the behaviour in the post-recession growth period in the

1990s. While part-time employment growth recovered quickly, full-time employment continued to decline for many quarters after the trough and only slowly picked up in the late 1990s.
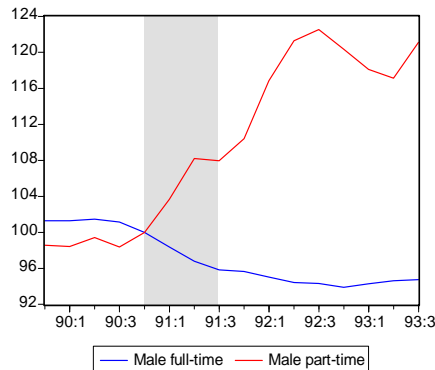
Figure 3 Full-time and part-time employment for males and females over 2 recessions
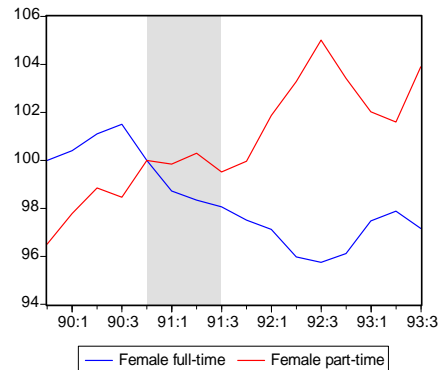

(a) Males 1981:1 to 1985:2

(b) Females 1981:1 to 1985:2

(c) Males 1989:4 1993:3

(d) Females 1989:4 1993:3

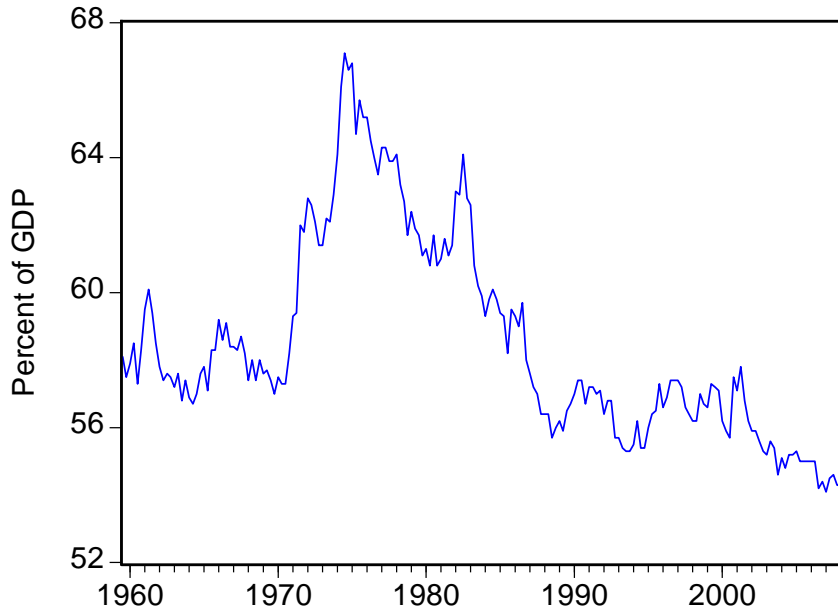Note: The peak-trough periods are defined in Mitchell (2001a).

3.   Price and wages growth in Australia and the Phillips curve

Figure 4 shows the wage share in Australia since the September 1959 (to June 2008). It is very notable that over the course of the most recent expansion, the wage share has been falling and is now at historically record lows. Decomposing the share into its constituent parts (see Figure 5) leads to the following conclusions:

(a) Real wages growth was sluggish up until the acceleration in employment growth in after 2003, whereupon the growth increased but remained modest. In the last year and a half real wages fell;

(b) Labour productivity accelerated around 1995 and has significantly outstripped real wage growth, hence explaining the rapid decline in the wage share. Clearly, the business sector has been diverting the productivity gains into profit margins instead of more broadly sharing the benefits; and

(c) The combination of prolonged labour market slack (aided by the rise in underemployment) after the 1991 recession and the increasingly hostile federal legislation introduced to drive unions out of the bargaining process over this period

5

have suppressed the capacity of workers to realise real wage growth commensurate with their contribution to production.

Figure 4 Wage share, Australia, 1959 to 2008, percentage of GDP

Source: RBA Bulletin database.

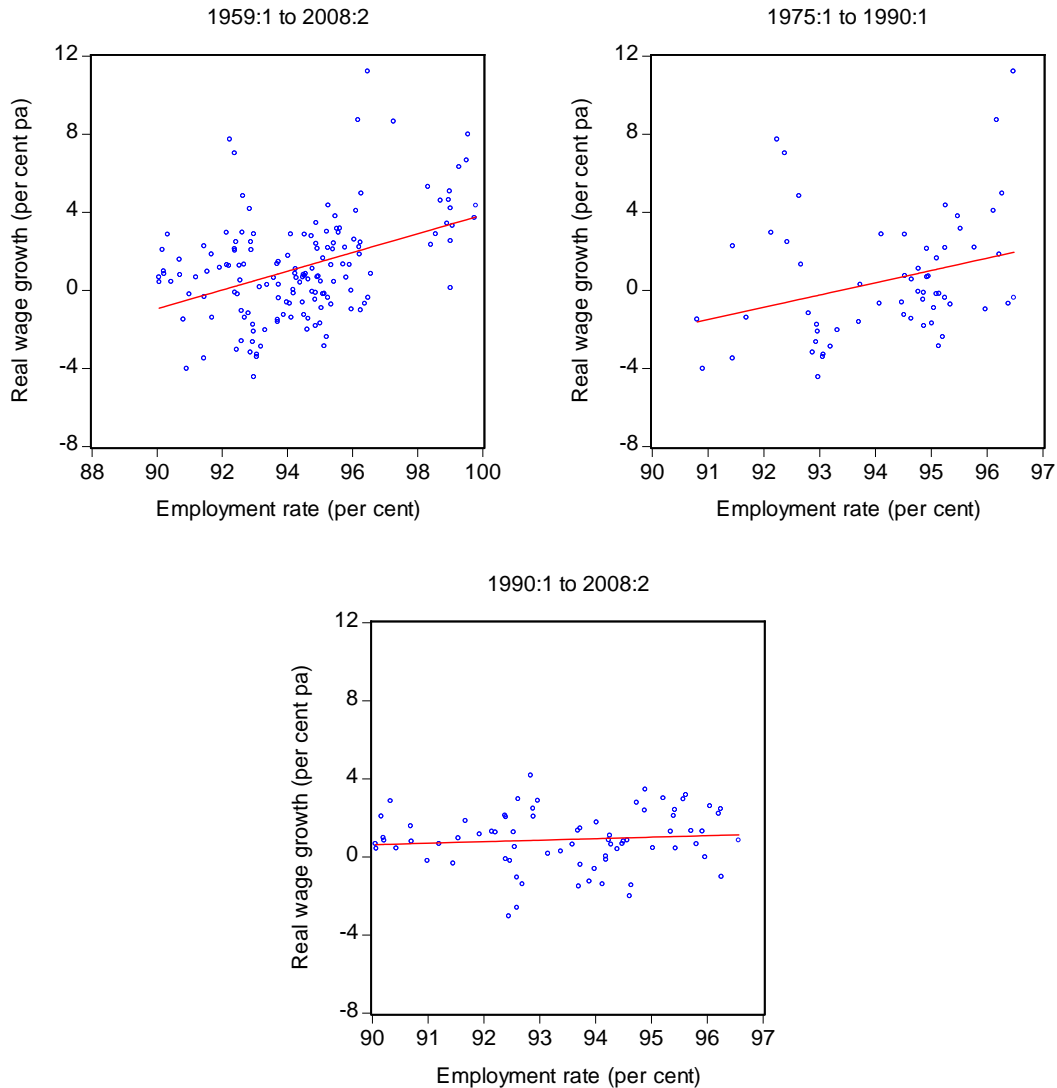Figure 5 Labour productivity and real wage indexes, Australia, 1992:1 to 2008:2

Source: RBA Bulletin database.

The Phillips curve typically uses some form of the unemployment rate as the proxy for excess demand in the labour market. The changing labour market dynamics outlined above suggests that wage discipline may also be exerted by underemployment, through

the precariousness of employment. This would also explain the absence of wages growth in the current boom. In this case, a respecified wage adjustment equation would be warranted.

Figure 6 shows the relationship between the employment and real wage growth in Australia for three periods: (a) Full sample, 1959:3 to 2008:2; (b) The period 1975:1 to 1990:1, which marked the major rise and persistent in the unemployment rate but also the strong employment growth recovery of the 1980s; and (c) The most recent growth cycle. The individual graphs are drawn to the same vertical scale.

Figure 6 Employment rate and real wage growth, Australia, various periods, per cent

Source: ABS TRYM model database.

Consistent with this view, is the expectation of a change in the relationship between the employment rate (which embodies the shift to underemployment) and real wage growth over time. It is clear that in the recent growth cycle, rising employment rates were not translated into the growth in real wages that the economy had previously delivered. We argue that this is consistent with the view that underemployment is now a primary vehicle for wage discipline.

7

4.   A model of the Phillips curve and the NAIRLU

In this Section we develop a formal model to explain the relationship between the inflation and the NAIRLU. The standard Phillips curve analysis is a model where firms and unions bargain over wages (Carlin and Soskice, 2006, Ch. 3.1; Blanchard, 2006, Box 3). Union behaviour is such that the bargained nominal wages increase relative to expected inflation π^e plus productivity growth y; when the unemployment rate, u decreases. This yields the wage setting (WS) relation:

(1) $w = \pi^e + y - \beta u + c_w$

where c_w is other factors that influence wage outcomes.

Firms are assumed to set their prices as a mark-up on wages such that the warranted real wage growth equals productivity growth. This price setting behaviour (PS) results in the following relation:

(2) $w = \pi + y + c_p$

where c_p is other factors that influence price setting.

Combining wage and price setting behaviour then yields the standard Phillips curve:

(3) $\pi = \pi^e - \beta\left(u - u*\right)$

where $u*$ is the NAIRU and often also identified as the natural rate of unemployment (for a critique see Mitchell and Muysken, 2008).

The kind of reasoning embodied in Equation (3) assumes that nominal wage growth is influenced by unemployment in a linear way. In our view this approach ignores two important and related features of the labour market: (a) persistence in unemployment; and (b) labour market segmentation. We emphasise both aspects in our analysis.

Piore (1973) developed a multi-tiered model of segmentation. This seemingly influenced the recent work of Fichtenbaum (2006) who introduces an intermediate labour market to complement the primary and secondary structures defined by the traditional dual labour market theory.[2] Fichtenbaum (2006: 290) notes that in the primary labour market 'jobs require a considerable amount of formal education as well as a significant amount of on the job training.' In the intermediate labour market 'jobs require some degree of preparation which might involve an associate's degree, an apprenticeship or some type of formal vocational education' (*ibid*, 290). Finally, in the secondary labour market 'jobs require little or no preparation and most training is done on the job usually by a fellow worker in a relatively short period of time. These occupations involve helping people and following instructions' (*ibid*, 290).

We argue that employment in the primary labour market is determined independent of the price setting process and reflects intrinsic characteristics of that market in terms of the need to maintain attachment and productivity gains. The real wage is determined by the price setting of firms once nominal wage bargains are settled (Carlin and Soskice, 2006: 627).[3] Thus the real wage w_p of these workers is relatively high and both the real wage and the level of employment N_p on the primary market are largely independent of aggregate demand fluctuations. Only extraordinary demand failures would threaten employment in this sector.

As we have observed in Section 2, for many OECD countries the recessions in the 1980s and 1990s, have been used to replace full-time, mainly male, employment by

part-time employment, mostly female in nature. The neo-liberal period has been marked by high levels of labour underutilisation and deregulation of the labour market, both of which provided incentives to employers to reduce worker entitlements. By reorganising work practices in such a way that part-time work can be introduced employers have two advantages: (a) part-time employment is cheaper because of relatively lower fixed costs (for example, in Europe, the compulsory social security contributions are lower); and (b) part-time employment is easier to adapt to changing circumstances by shifting working hours and often flexible in duration because quite a few persons are willing to work longer hours.
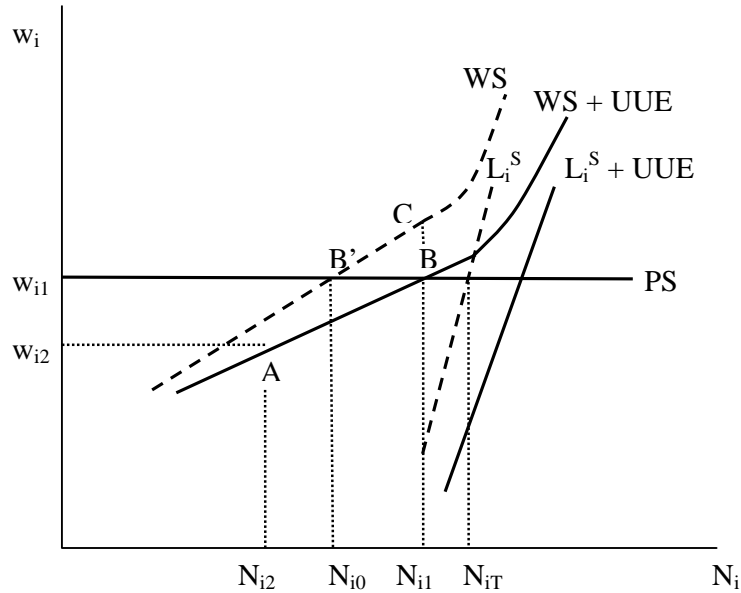
Firms now perceive a more flexible labour supply, albeit relatively inelastic in terms of persons. This has led to the rise of the intermediate labour market for workers with characteristics that are not significantly different from (potential) workers in the primary labour market, that is, with a reasonable amount of education and training. The intermediate labour market serves as a buffer for the primary labour market by channelling its inflow and taking over several functions of the traditional primary labour market by employing more flexible labour. In this market relatively strong unions bargain over wages and employment.

The way in which the intermediate labour market works can be understood by analysing the relevant wage-setting and price-setting curves (see Figure 7). The horizontal PS-curve reflects that price-setting behaviour of firms is such that the warranted real wage of firms w_{i1} is largely independent of fluctuations in employment. The wage negotiations by the unions will lead to the wage setting curve WS. A crucial feature of wage negotiations in this market is that wages react in particular to short-term unemployment, for two reasons. First of all, long-term unemployment will be relatively low on the intermediate labour market since persons who become long-term unemployed will move to the secondary labour market. Second, to the extent long-term unemployment prevails, the long-term unemployed do not put pressure on inflation. As Ball (1999: 231) says '[T]his is possible because of the small cost of hiring the long-term unemployed. With this cost, firms prefer the short-term unemployed to the long-term unemployed, making the latter irrelevant to wage determination, but they prefer to hire the long-term unemployed rather than hire nobody.' Finally, the actual labour supply curve L_i^S is assumed to be fairly inelastic with respect to increases expected real wages. Following the standard approach we therefore would find an equilibrium at point B', with employment N_{i0}.

Increased flexibility in this model is captured by the incidence of involuntary part-time employment (underemployment). The presence of underemployment implies that effective labour supply in terms of standard hours in Figure 7 is depicted by the wage setting curve WS + UUE, where UUE stands for utilised underemployment. As a consequence when demand for labour equals N_{i1}, the bargained real wage in absence of underemployment would be at C. However, underemployment has a mitigating impact on wage increases since involuntary part-time employed persons are willing to work a buffer of $(N_{i1} - N_{i0})$ longer hours at the wage w_{i1}; therefore the utilised underemployment UUE at w_{i1} equals $(N_{i1} - N_{i0})$.[4]

In reaction to a lower demand for labour being imposed by the level of effective aggregate demand in the product market represented here as a shift to N_{i2}, the economy will move to point A, with a lower bargained real wage at w_{i2} following a decrease in nominal wage demand.

Figure 7 Wage determination in the intermediate labour market

As a consequence underemployment will increase in Figure 7, while employment decreases. However in relation to the decrease in nominal wage demand, firms will decrease their prices and, if, government uses fiscal and/or monetary stimulation, as expected, their demand for labour will increase as the macroeconomic ration eases. Thus the economy will move along the WS curve from *A* to *B*. This process of real wage growth is accompanied by a decrease in both unemployment and underemployment.

Moreover, the change in unemployment will manifest as changes in short-term unemployment. When employment (in terms of persons) corresponding to *A* and *B'* equals N_{i2} and N_{i0}, respectively, unemployment fluctuates between $(N_{iT} - N_{i2})$ and $(N_{iT} - N_{i0})$. As a consequence $(N_{i0} - N_{i2})$ persons are short-term unemployed and $(N_{iT} - N_{i0})$ persons are long-term unemployed. The amount of long-term unemployed persons will decrease further when there is a sustained upturn, pushing employment beyond N_{i1}.

Bargained nominal wage growth, w_i, in the intermediate labour market is thus given as:

(4) $w_i = \pi^e + y - \beta_i u_i^s - c_i u_i^u + d_i$

where u_i^s represents the rate of short-tem unemployment and u_i^u the rate of underemployment, both in the intermediate labour market; β_i, γ_i and d_i are the wage equation coefficients.[5]

Intermediate labour market workers are relatively well qualified (skilled), their jobs are relatively secure and wages are bargained by relatively strong unions. This does not hold for the secondary labour market, however. Here workers are poorly educated and hardly any training is provided. Job security is very low and casual jobs prevail in abundance. Unions do not have a very strong position and the minimum wage typically sets a floor to wage bargaining. As a consequence, the secondary labour market is characterised by a relatively low warranted real wage w_s, which will be influenced by the minimum wage w_{min}.

Figure 8 Unemployment in the secondary labour market

This is illustrated in Figure 8 by the horizontal PS curve at w_{s1}. Wage setting behaviour starts at the minimum wage and the wage setting curve is increasing in employment as is shown by the WS curve in Figure 8; again we assume that long-term unemployment has no significant impact on wage bargaining. Moreover, similar to the case of the intermediate market, underemployment has a moderating effect on wages. This is represented by the *WS + UUE* curve in Figure 8, where *UUE* again represents utilised underemployment. When nominal wage demand decreases after a fall in demand for labour from N_{s1} to N_{s2}, $(N_{s0} - N_{s2})$ persons are short-term unemployed – analogous to the situation in Figure 7. Finally, $(N_{sT} - N_{s0})$ persons are long-term unemployed and underemployment equals $(N_{s1} - N_{s0})$.

Analogous to the case of the intermediary labour market, the bargained nominal wages growth, w_s, in the secondary labour market is given by:

(5) $w_s = \pi^e + y - \beta_s u_s^s - \gamma_s u_s^u + d_s$

Summarising our analysis thus far, we propose that:

- Underemployment is used next to short-term unemployment to discipline wages in the intermediate and secondary labour markets;

- Nominal wage rigidities are stronger: (a) the slower inflationary expectations adapt in the intermediate labour market; and (b) the less the minimum wage in the secondary labour market follows inflation.

- Real rigidities are stronger: (a) the stronger the primary labour market is represented in the economy; and (b) the slower inflationary expectations adapt in the intermediate labour market.

- Persistence in unemployment is present in the intermediate labour market and, in particular, in the secondary labour market.

The differences in wage setting behaviour on the three markets imply a different specification of the overall *WS*-curve relative to that depicted in Equation (1). Combining Equations (4) and (5) with the primary labour market wage setting, aggregate nominal wage growth can be specified as follows:

(6) $\qquad w = \pi^e + y - \beta_T u^s - \gamma_T u^u + \gamma_p g_p + \gamma_i g_i + d_T$

where the coefficients β_T, γ_T and d_T are weighted averages of the related coefficients in the individual equations. The two additional variables, g_p and g_i, are the growth rates of the share of the primary labour market and the intermediate labour market in total employment, respectively. Hence, when the primary labour market and/or the intermediate labour market grow in relative importance, this may affect average wage growth.

The implication for the specification of the Phillips curve is now obvious. This becomes:

(7) $\qquad \pi = \pi^e - \beta_T u^s - \gamma_T u^u + \gamma_p g_p + \gamma_i g_i + d_T$

Therefore one would expect that both short-term unemployment and underemployment to be significant influences in the inflation equation and that the Phillips-curve shifts with changes in the shares of the three markets.

5. Estimating the impact of labour underutilisation on inflation

The model in Section 4, generates several interesting testable hypotheses that link the labour underutilisation, broadly defined, to the inflation process. Carlson and Mitchell (2003) applied the broader hours-based underutilisation measures developed by the Centre of Full Employment and Equity to consider the role they might play in the Australian inflation process. They reasoned that proximity to the wage determination process was important to influence wage outcomes. In that respect, the long-term unemployed may be considered too distant to discipline the wage process. However, while the short-term unemployed may be proximate enough to influence wage and price movements, an even more proximate source of surplus labour available to employers to condition wage bargaining is the underemployed.

This pool of hours can be clearly redistributed among a smaller pool of persons in a relatively costless fashion if employers wish. The conjecture then is that the underemployed pose a viable threat to those in full-time work who might be better placed to set the wage norms in the economy. This argument clearly modifies the insider-outsider dichotomy that was common in the battle of the mark ups literature. For now, some of the insiders – those that are forced into precarious and hours constrained employment - are used as excess labour supply, which reduces the power of the workers generally.

This conjecture also raises an interesting parallel to another aspect of the hysteresis hypothesis. Ball (1999: 230) argues that 'hysteresis is reversible: a demand expansion can reduce the NAIRU … [because employers] … would rather pay the training costs than leave the jobs vacant.' A similar observation underpins the hysteresis models in Mitchell (1987, 1993). In a high pressure economy, firms lower hiring standards and address the skill deficiencies of the long-term unemployment by offering on the job training.

Using Australian data, Carlson and Mitchell (2003) find that while the short term unemployment rate exerts a negative influence on the annual rate of inflation, the added

effect of the underemployment variable is statistically significant and reduces the magnitude of the negative impact of the unemployment rate. They rationalise their results by suggesting that in a downturn short-term unemployment increases sharply, which reduces inflation because the inflow into short-term unemployment is comprised of those currently employed and active in wage bargaining processes. In a prolonged downturn, average duration of unemployment rises and the pressure exerted on the wage setting system by unemployment overall falls. This requires higher levels of short-term unemployment being created to reach low inflation targets with the consequence of increasing proportions of long-term unemployment being created. In addition, as real GDP growth moderates and falls, underemployment also increases placing further constraint on price inflation.

Their other notable result was that a long-term trade-off between unemployment and inflation is implied in all regressions based on a NAIRU dynamics test statistic from Fair (2000). In that sense, the constant NAIRU hypothesis was strongly rejected as there is no convergence to a constant equilibrium rate of short term unemployment after an employment shock. The transitory equilibrium short-term unemployment rate is contingent on the evolution of employment growth and demand in general. The results indicate that a deflationary strategy using demand repression (tight monetary and fiscal policy) will be costly in terms of unemployment and other forms of labour underutilisation.

Following Mitchell (2001), we use a general autoregressive-distributed lag Phillips curve representation like:

(8) $\qquad \dot{p}_t = \alpha + \sum_{i=1}^{n} \delta_i \dot{p}_{t-i} + \sum_{i=0}^{m} \beta_i u_{t-i} + \sum_{i=0}^{q} \gamma_i z_{t-i} + \varepsilon_t$

where $\dot{p}_t$ is the rate of inflation, u is the unemployment rate, z is a cost shock variables (like import price inflation, capital costs), and the ε is a white-noise error term.

The parameterisations of the excess demand variable that we consider are all assumed to be $I(0)$ variables given they are bounded and are:

(a) The official unemployment rate (UR). In each case we tried four-quarter moving average representations of the underutilisation variable to match it with the annualised change in the dependent variable. The high persistence in the underutilisation series means the results are very similar and are not reported;

(b) The level of the short-term unemployment rate ($STUR$) defined by ABS as those unemployment for less 52 weeks as a percentage of the total labour force;

(c) The level of the underemployment (UE) computed from the CLMI as explained above; and

(d) The difference between the levels and the filtered trend derived using a Hodrick-Prescott filter. The variables created are UR Gap and $STUR$ Gap. This construct is now commonly used and has been referred to in papers by the OECD and others as a test of the TV-NAIRU hypothesis (Boone, 2000; see also Mitchell, 2001 for more detail). We examine the validity of this inference below.

We initially develop a Phillips curve model for Australia using 4 lags on the annualised inflation terms ($D4LP$) and import prices ($D4LPM$), the level of the unemployment rate, a dummy variable, $DGST$ (defined as 1 in 2000:3 and zero otherwise) to take into account the introduction of the Goods and Services Tax system in Australia in July

2000. Other influences mentioned in the literature including the cost of capital, interest spread, and payroll taxes were not significant in the final tested-down specification.

Using standard unit root tests (ADF and KPSS) we find that the inflation and import price inflation series are $I(1)$ and that they co-integrate, meaning that we can use them in a regression with stationary variables like the underutilisation measures. To some extent, our analysis ignores any broader interaction between cointegration and the related error correction dynamics. The statistical validity of the exercise is to be judged by the diagnostic performance of the models.

Table 1 Phillips curve regressions, Australia, 1978:1 to 2008:2

	Eq 1.1	Eq 1.2	Eq 1.3	Eq 1.4	Eq 1.5	Eq 1.6	Eq 1.7	Eq 1.8
Constant	0.014	0.022	0.015	0.025	0.001	0.016	0.002	0.018
	(3.69)	(3.35)	(2.40)	(3.70)	(0.90)	(3.20)	(1.36)	(3.81)
ΔLP(-1)	0.951	0.852	0.980	0.864	0.968	0.872	0.966	0.853
	(47.5)	(22.4)	(44.2)	(21.8)	(45.0)	(23.1)	(49.8)	(23.2)
UR(-1)	-0.006	-0.002						
	(3.53)	(0.54)						
STUR(-1)			-0.009	-0.004				
			(2.4)	(1.10)				
UR Gap							-0.003	-0.002
							(2.98)	(2.08)
STUR_GAP					-0.005	-0.003		
					(3.60)	(2.40)		
UE		-0.013		-0.012		-0.010		-0.012
		(3.75)		(3.50)		(3.10)		(3.64)
$\Delta\Delta$LPM	0.067	0.062	0.072	0.062	0.067	0.060	0.067	0.060
	(3.87)	(3.93)	(4.40)	(4.00)	(4.20)	(3.90)	(3.84)	(3.83)
GST	0.026	0.027	0.026	0.027	0.025	0.026	0.024	0.026
	(2.85)	(3.71)	(3.30)	(3.70)	(3.30)	(3.60)	(2.58)	(3.59)
Adjusted R2	0.946	0.946	0.942	0.947	0.945	0.949	0.944	0.948
SE % DV	15.4	15.0	15.6	14.9	15.2	14.6	15.6	14.7
SC(1)	0.092	0.065	0.209		0.382	0.197	0.796	0.039
SC(4)	0.000	0.000	0.000		0.000	0.000	0.000	0.000
ARCH(1)	0.187	0.055	0.572		0.310	0.042	0.005	0.057
RESET	0.896	0.330	0.195		0.231	0.240	0.866	0.187
NAIRU test	0.002	0.00	0.000	0.000	0.030	0.000	0.000	0.000

Notes: SC(n) is the Breusch-Godfrey Serial Correlation LM(n) test, ARCH is a 1th order test for Autoregressive conditional heteroscedasticity, RESET is the Ramsey RESET test with one added term, NAIRU is the Wald Test for homogeneity with 4 lags of ΔLP included. All tests are reported as prob values. SE%DV is the standard error as a percentage of the mean of the dependent variable and t-statistics are in parentheses.

Sequential testing down from the general equation using different measures of the underutilisation variable yielded the results shown in Table 1. In each case, the dynamics were so close and the coefficient estimates for the other variables were highly

14

stable that a common specification is employed to aid comparison. In general, the diagnostics of all equations were satisfactory apart from some evidence of fourth-order serial correlation, which could reflect the four-quarter change specification.

Equation (1.1) in Table 1 describes a typical Phillips curve using the aggregate unemployment rate (*UR*). The unemployment rate exerts a very modest negative influence on the rate of inflation (-0.006). The added effect of the underemployment variable (*UE*) is depicted in Equation (1.2). It is statistically significant which indicates that it exerts negative influence on annual inflation. Further, *UR* is no longer statistically significant. In Equation (1.3), the *STUR* exerts a higher degree of negative pressure on inflation (-0.009) than that estimated for *UR* in (1.2). When UE is added it is statistically significant and *STUR* loses statistically significance (Equation 1.4).

Equations 1.5 to 1.8 utilise the gap specification for the excess demand variable. Mitchell and Muysken (2008) argue that the NAIRU concept remains on shaky theoretical grounds. The original theory underpinning the NAIRU provides no guidance about its evolution although, unspecified structural factors should be involved to remain faithful to that theory. In this theoretical void, econometricians use techniques that allow for a smooth evolution although there is no particular correspondence with any actual economic factors. Some authors assert that a Hodrick-Prescott filter through the actual series captures the TV-NAIRU (for example Boone, 2000 among many). Of-course, the Hodrick-Prescott filter merely tracks the underlying trend of the unemployment and follows it down just as surely as it follows it up. The unemployment rate is highly cyclical and the TV-NAIRU proponents are silent on this apparent anomaly – why do the alleged structural factors cycle with the actual rate?

Equations (1.5) and (1.6) compare *STUR Gap* with and without the *UE* variable. The results suggest that: (a) underemployment plays a significant constraining influence on inflation independent of the unemployment; (b) STUR Gap is highly significant and a 1 per cent deviation above the filtered value leads to a 0.5 per cent slowdown in the annual inflation rate; and (c) the specification is improved on Equations (1.1) to (1.4). In Equation (1.7) and (1.6) we make a similar comparison using the *UR Gap* variable. The preferred equation of the two includes *UE*. The constraining influence of the UR Gap variable is also smaller (in that it includes *LTU*). There is a minor preference for Equation (1.6) over Equation (1.8).

The different values of the coefficients on the *STUR* and *UR* variables suggest the following dynamics are plausible. A downturn increases short-term unemployment sharply, which reduces inflation because the inflow into short-term unemployment is comprised of those currently employed and active in wage bargaining processes. In a prolonged downturn, average duration of unemployment rises and the pressure exerted on the wage setting system by unemployment overall falls. This requires higher levels of short-term unemployment being created to reach low inflation targets with the consequence of increasing proportions of long-term unemployment being created. In addition, as real GDP growth moderates and falls, underemployment also increases placing further constraint on price inflation. The results taken together provide support the hypotheses that flow from the model developed in Section 4.[6]

An additional finding is that a long-term trade-off between unemployment and inflation is implied in all regressions. The NAIRU dynamics test statistic shown in Table 1 (see Fair, 2000) allows us to easily reject the null that the sum of the coefficients on the lagged inflation terms is unity in all regressions. In that sense, we would reject the constant NAIRU hypothesis.[7] So even though the short-term unemployment rate is

relatively more effective in controlling inflation, there is no convergence to a constant equilibrium rate of short-term unemployment after an employment shock. The transitory equilibrium short-term unemployment rate is contingent on the evolution of employment growth and demand in general. The results indicate that a deflationary strategy using demand repression (tight monetary and fiscal policy) will be costly in terms of unemployment.

6. Conclusion

The title of our paper challenges the claim that low unemployment will always be inflationary. By taking a broader view of labour underutilisation we find that underemployment also servers to modify wage demands. Inspired by observing the interaction between the dynamics of underemployment and inflation in Australia we develop a model of the labour market in which we construct a three-tier labour market comprising: (a) a primary labour market where both employment and wages are not affected by cyclical variations; (b) an intermediate labour market which serves both as a port of entry and a buffer for the primary labour market, here active bargaining over wages and employment takes place; and (c) a secondary labour market, where wages are conditioned by the minimum wage, although some bargaining may take place. In both the intermediate and the secondary labour market, underemployment and short-term unemployment discipline wage demands.

We argue that the traditional Phillips-curve idea that the unemployment rate *per se* disciplines the wage inflation process is no longer valid. Instead, we argue that the inflow into short-term unemployment is comprised of mainly intermediate labour market workers who are active in wage bargaining processes, which therefore will modify wage restraints in a downturn. Further, as underemployment also increases in a downturn, employers can use hours of work as an adjustment in the upturn to meet higher demand which places a further constraint on wage bargaining.

We apply this alternative Phillips curve specification to Australian data (for the period 1978:1 to 2008:2) and show that the labour market restraint works both through short-term unemployment rates and via underemployment.

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[2] Fichtenbaum distinguishes between two tiers of the primary labour market, the independent and the subordinate primary labour markets. The latter is denoted by us as the intermediate labour market.

[3] It seems plausible that employers are paying efficiency wages, both to reduce turnover costs and to motivate their workers. In that case unionisation is not a very relevant characteristic for the wage setting process, which is consistent with Fichtenbaum's (2006) finding of a very low union effectiveness for the USA in the independent primary market.

[4] Since at a higher wage rate more of the labour slack will be utilised, utilised underemployment will increase – therefore the UUE line is upward sloping.

[5] Nominal and real wage rigidities can be introduced in this part of the analysis of the labour market by emphasising the difference between expected inflation and actual inflation on the one hand, which leads to nominal rigidites; allowing expected productivity growth to adapt slowly to actual productivity growth – see Blanchard (2006, Box 1).

[6] We did not find structural shifts, corresponding to shifts in the composition of labour markets. However, Figure 2 suggests a structural shift in the relationship between unemployment and underemployment which might capture a composition shift. We leave this as a question for further research.

[7] Mitchell (2001a) tested for NAIRU dynamics in similarly derived Phillips curve models for Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. There was no evidence of a constant NAIRU operating in these countries. In each case, there is evidence of a non-vertical long-run Phillips curve although for Canada, France, and Italy, the findings are weak. Further, in the case of the

United Kingdom and the United States, the change of unemployment is statistically significant indicating that hysteretic forces are present.