UNEMPLOYMENT AND SKILLS IN AUSTRALIA

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Abstract

In Australia, as in many other countries, labour-market groups with higher skill levels generally enjoy lower unemployment rates. This paper investigates why this might be the case, whether this is a recent phenomenon, and whether declining demand for unskilled labour, perhaps coupled with wage inflexibility, is an important explanation for the observed increase in the Australian unemployment rate over the past three decades.

We find that relative demand shifts towards skilled labour are not an important determinant of the increase in overall unemployment. The shift in demand towards skilled labour has been matched by an equivalent shift in labour supply, leaving the structure of relative unemployment rates across skill groups fairly stable. Unemployment of both skilled and unskilled labour has increased, but this appears to be for reasons unrelated to relative demand shifts across skill groups.

We also discuss possible reasons for the pervasively higher unemployment rates of less-skilled workers, drawing on data on individuals from the Survey of Employment and Unemployment Patterns (SEUP). We find that the high unskilled unemployment rate is associated with a higher exit probability from employment relative to skilled workers (a high 'separation rate'), and a lower probability of finding employment from non-employment (a low 'matching rate').

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1. Introduction

In Australia, as in many other countries, vast differences exist in the unemployment rates faced by different skill groups. For example, in May 1998 the unemployment rate for those with bachelor degree or postgraduate qualifications was 3.1 per cent, compared with 8.6 per cent for those with only final secondary education and 11.7 per cent for those who had not completed high school.[1] One possible explanation for such large differences is that labour market regulations such as minimum award wages are more binding for less-skilled workers, and prevent the market for unskilled labour from clearing. However, this does not seem a complete explanation, since unskilled unemployment is relatively high even in countries with deregulated labour markets and very low minimum wages, such as the United States.

This paper documents the main empirical features of the Australian labour market disaggregated by various measures of skill. It also discusses a number of important questions regarding skilled and unskilled labour:

- is the observed shift in demand towards skilled labour in Australia an important cause of the increase in aggregate unemployment over the past three decades?

- have unemployment rates for unskilled workers relative to skilled workers deteriorated over time?

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[1] These data are from *Transition from Education to Work*, ABS Cat. No. 6227.0. When classifying individuals according to educational attainment, we generally refer to their most advanced level of education. Thus, 'completed high school' refers to a person who has completed secondary school but has no tertiary qualifications. 'Not completed high school' does not include individuals who did not complete secondary school, but do have further qualifications.

- what are some possible explanations for why unskilled workers have consistently higher unemployment rates than skilled workers? What evidence can we bring to bear to decide which of these explanations is most important?

To preview our findings, we conclude that changes in unemployment across different skill groups can be mainly accounted for by aggregate factors. Unskilled unemployment rates were always much higher than skilled unemployment rates, even when the aggregate unemployment rate was low. Both types of unemployment are now much higher than in the 1960s. There is little support for the argument that the significant rise in overall unemployment in Australia since the 1960s has been caused by declining demand for unskilled labour coupled with inflexible wages for these workers. Using data on transition probabilities we find that the high unemployment rate for less-skilled workers is accounted for partially by a higher exit probability from employment relative to skilled workers (a high 'separation rate'), and partially by a lower probability of finding employment from non-employment (a low 'matching rate').

In Section 2 we examine international evidence on unemployment by skill, and provide a framework for examining labour demand and supply shifts for different skill groups. We use this framework to illustrate the effects of an aggregate labour demand shift, and a relative demand shift towards skilled labour, on skilled and unskilled employment, unemployment and wages. In Section 3, we break the Australian labour market down by occupational and educational measures of skill, highlighting differences in labour market performance between the different groups. An application of the framework developed in Section 2 suggests the evolution of skilled and unskilled unemployment is consistent with a series of aggregate labour market shocks. Section 4 examines transition probabilities between labour market states for different levels of educational attainment using data on individuals from the Survey of Employment and Unemployment Patterns. This analysis is used to examine reasons why unskilled unemployment has been consistently higher than skilled unemployment in recent history.

2. International Evidence and Theory

Our first task is to define the meaning of skill. In theoretical models, the labour force is generally divided neatly into a 'skilled' group and an 'unskilled' group, where skilled labour characteristically has higher productivity than unskilled labour.[2] Following in this vein, much empirical research has defined distinct skill groups according to measured worker characteristics likely to be correlated with a worker's marginal product, such as educational attainment, occupation or years of experience in the labour force.

An alternative approach, applied in Juhn, Murphy and Topel (1991), is to classify skill levels by an individual's position within the earnings distribution. Despite the conceptual appeal of such an approach, it has some drawbacks. The first is that many individuals are unemployed, and thus do not have any market income. (Juhn *et al* calculate an imputed skill level for these individuals by comparing their observed characteristics to workers at different points in the wage distribution.) Secondly, if employee remuneration is not competitively determined, but instead reflects the extraction of rents, then observed remuneration will not be an accurate reflection of marginal product, Thirdly, the Juhn *et al* approach provides a relative, rather than an absolute, measure of skill. It does not capture changes in the skill base of the workforce as a whole, such as an increase in the average level of education.

A third approach to measuring skill is to rank occupations according to the intensity of different abilities used, such as cognitive, interactive and motor skills (Pappas 1998). This approach highlights the fact that the ability set required for many 'low-skilled' occupations is substantially different from that required for 'high-skilled' jobs.

For the purposes of this paper, we refer to skills in a general sense as relatively higher levels of education, experience or inherent abilities that enhance an individual's productivity. Empirically, we use educational attainment and occupation to classify individuals according to skill level.

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[2] Examples include Berman, Bound and Machin (1997) and Haskel and Slaughter (1998) from a trade perspective, and Nickell and Bell (1995) and Jackman *et al* (1997) from the labour economics literature.

2.1 Unemployment and Skills Across the OECD

Figure 1 presents unemployment rates by educational attainment for a number of OECD countries, including Australia. Since the level of education used to distinguish skill groups differs across countries, it is not possible to make direct cross-country comparisons of the rates of skilled and unskilled unemployment. However, several facts are clear.

First, skilled and unskilled unemployment in each of these countries fluctuates in a relatively synchronised fashion. Changes in the unemployment rates for different skill groups are mainly determined in the short run by the state of the business cycle.

Second, the unskilled unemployment rate is much higher than the skilled rate within each country. This fact is true both for nations with highly deregulated labour markets (the United States) and nations with centralised, highly regulated markets (such as France). The only exception to the rule that the less educated have higher unemployment rates is Italy; however, this appears to reflect country-specific factors. Italy has a much less generous social security system than other OECD countries,[3] and educational attainment is strongly correlated with parental income. Thus, young educated workers are often able to live off parental income while searching for a job, whilst less-educated individuals do not have such opportunities.

Third, the aggregate unemployment rate has increased substantially in most of the countries shown. This has been associated with an increase in unemployment for both low- and highly-educated workers. However, in each case the percentage point increase in unemployment has been greater for the less-educated group.

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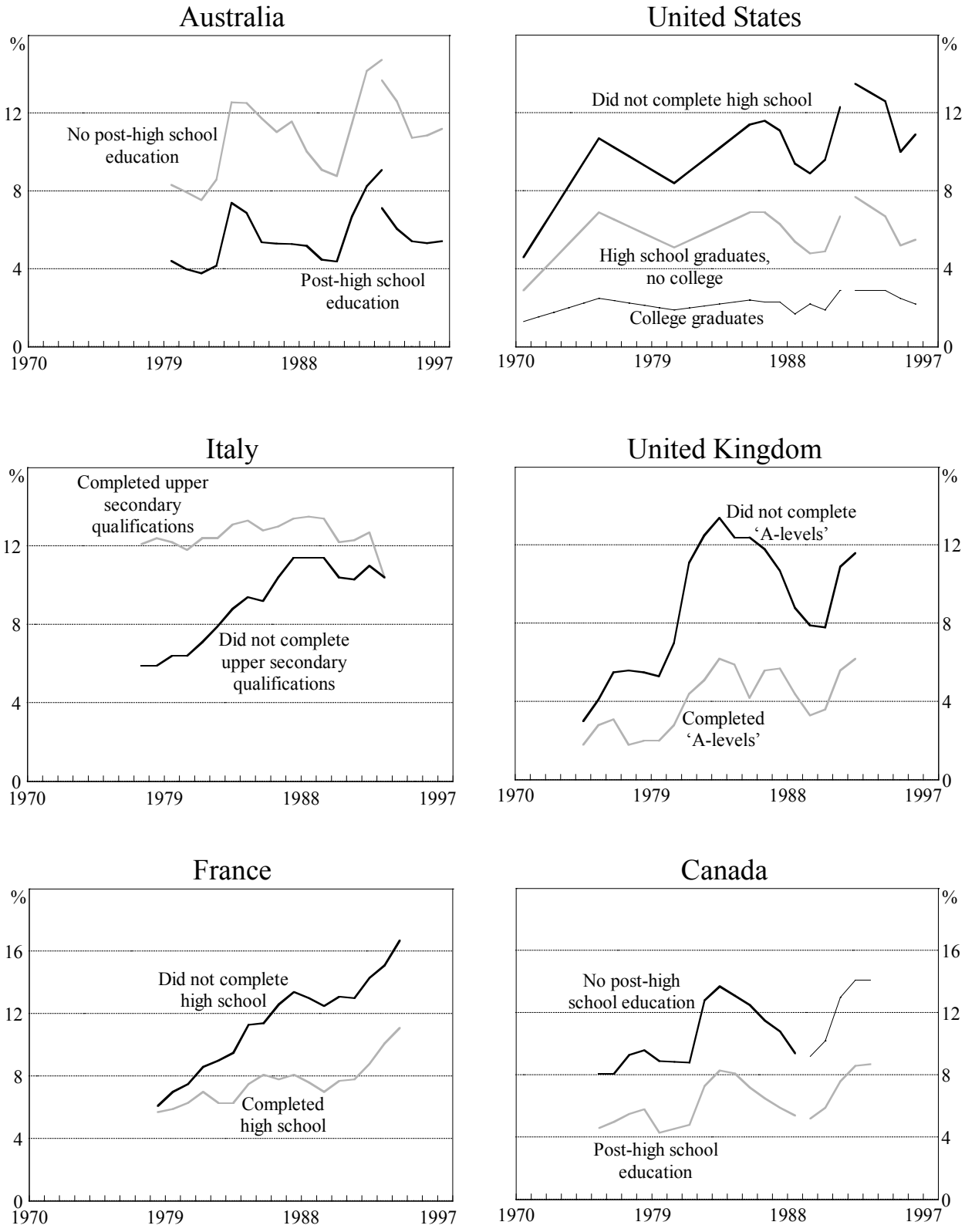
[3] Martin (1998, p. 296) reports that the replacement ratio in Italy is the lowest of a sample of 18 OECD nations, by a substantial margin. For a family experiencing long-term unemployment, the Italian replacement ratio is only a quarter as large as the next lowest country (the United States). A similar situation (no substantial unemployment benefit system and a high unemployment rate for educated individuals) exists in India.

Figure 1: Unemployment by Educational Attainment in Selected Countries



2.2 A Framework for Analysis

How can economic theory assist us in thinking about the evolution of skilled and unskilled unemployment? Nickell and Bell (1995) present a useful analytical framework suited to this purpose. In their model, the labour force is divided into a skilled and unskilled group, where the unemployment rate of each group is set by the interaction of a labour demand curve and a wage-setting curve. This wage-setting curve (alternatively referred to as an effective labour supply curve or supply-wage curve) represents a locus of employment and wage outcomes consistent with the wage-setting behaviour of employees and firms.[4] The existence of involuntary unemployment stems from the role of unemployment in matching the wage demands of workers and the mark-up behaviour of firms.

The relative positions of skilled and unskilled labour are drawn on Figure 2 – the diagram is drawn so that unskilled unemployment is higher than skilled unemployment, consistent with current experience. Both the wage-setting and labour demand curves are higher for skilled workers, reflecting their higher productivity. This diagram is drawn with the employment ratio (*employment/labour force*), rather than employment, as the x-axis. Thus, the unemployment rate is measured by the horizontal distance between equilibrium and an employment ratio of 1. Matching increases in labour demand and supply will leave the labour demand curve as drawn unchanged, since employment and the labour force increase proportionately.

We use this framework to examine the effects of demand and supply shifts on the unemployment rate. Firstly, we review how the demand for skilled and unskilled labour has changed across the OECD in recent decades.

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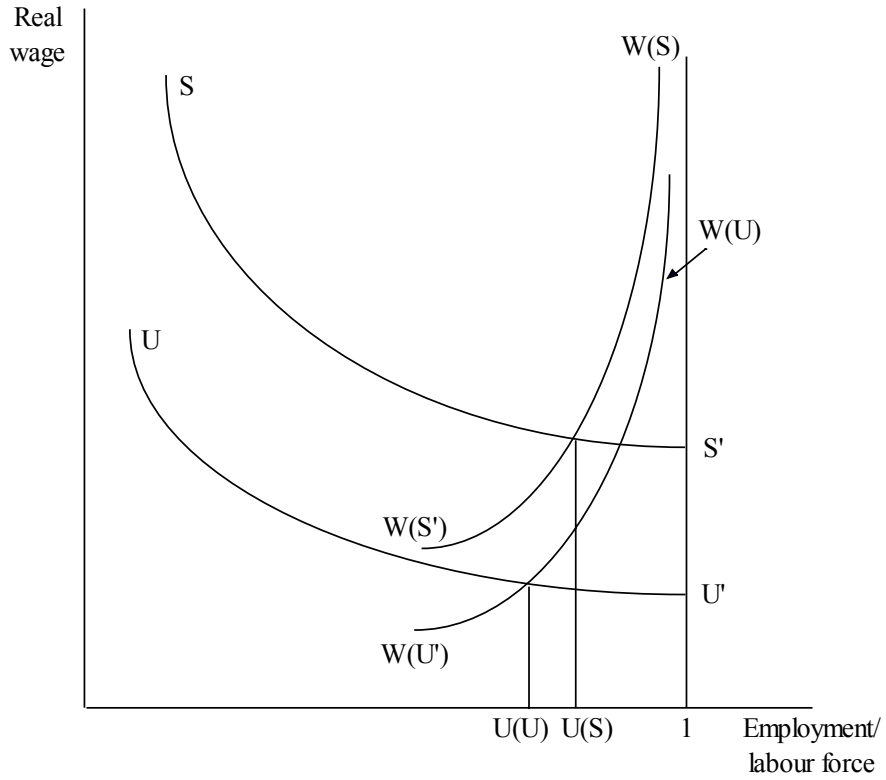
[4] The position of the wage-setting curve is affected by factors which influence the relative bargaining strength of insiders and outsiders, such as the degree of union power, generosity of welfare payments, and the level of long-term unemployment (see Layard, Nickell and Jackman (1991)).

Figure 2: Model of Skilled and Unskilled Labour Markets



Notes: S S′ and U U′ are the labour demand curves for skilled and unskilled labour.
W(S) W(S′) and W(U) W(U′) are the wage-setting curves for skilled and unskilled labour.
U(S) and U(U) are the unemployment rates for skilled and unskilled labour.

2.3 Demand Shifts

The most notable change in labour market conditions across skill groups in recent years has been a substantial increase in the demand for skilled labour. This has led to higher levels of skilled employment across the OECD, and in many countries a higher wage premium paid to skilled workers. Wages for low-skilled workers have not increased as quickly, and have actually fallen in real terms in some countries, particularly the United States. These trends follow in the wake of a long period during the 1950s and 1960s in which wage relativities between high- and low-income earners narrowed.

Two main explanations have been offered for this set of outcomes. The first of these is that increased trade competition from developing nations has, through factor price equalisation, reduced the wages of low-skilled workers in developed countries, and reduced the output of the industries which employ low-skilled workers intensively (see Wood (1995) for an exposition of this view). The current consensus is that this 'trade' argument explains only a small part of the increased demand for skill (Katz 1998).[5]

The more widely accepted explanation is that technological progress has increased the productivity of skilled workers relative to unskilled workers, a phenomena dubbed 'skill-biased technological change' (SBTC). Following Griliches (1969), various authors have argued that skilled labour is a complement in production to capital and/or technology, and that the degree of complementarity is much higher than for unskilled labour.

Several pieces of evidence have been offered in favour of SBTC. Firstly, the increased demand for skilled workers is not simply the result of changes in industry mix, since the proportion of skilled workers has increased in all industries, in both traded and non-traded sectors, often in spite of a higher wage premium paid to skilled labour. Secondly, there are strong correlations between measures of technological progress and increased demand for skills. Autor, Katz and Krueger (1998) find correlations between increased demand for skilled workers across firms and measures of computerisation such as computer capital per worker, computer investment as a share of total investment and growth in employee computer usage.[6] Thirdly, increased demand for skill appears to be a common feature of most developed countries' labour markets, and the same industries in different countries are increasing their proportion of skilled labour (Berman, Bound and Machin 1994). These trends are consistent with SBTC, since

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5 If the 'trade' explanation is dominant, we should expect a shift in employment towards skill-intensive industries and a reduction in the ratio of skilled to unskilled employment within each industry as a result of the fall in unskilled wages. These trends are not apparent in the empirical data for most countries (Krugman 1994). Slaughter and Swagel (1997) report that a number of different methodologies have been used to estimate the effect of increased trade and globalisation on wages and employment in the United States, and have generally found the effects to be only small.

6 Although see DiNardo and Pischke (1997) for a skeptical view of this evidence.

technological advances in one country would be expected to be readily transferable to other countries.

There is less evidence on SBTC for Australia than for some other countries. The available literature is reviewed in Borland (1998). Using data on relative wages, employment and labour supply, several authors have found that demand for Australian workers with higher levels of education has increased steadily since the 1970s. However, the relative extent to which trade, technology and other factors are responsible for this demand shift is still unresolved.

The effects of SBTC on the dispersion of wages and employment opportunities can be mitigated somewhat by improving education and training opportunities for the less skilled. Goldin and Katz (1998) propose this as an explanation for the contrasting evolution of the US wage structure from 1910 to 1940 compared with the past two decades, both periods where substantial SBTC was evident. In the earlier period, the increase in the return to skill was coincident with a massive expansion in secondary education, providing necessary skilled labour and containing wage relativities (which actually narrowed over this period). In the most recent period however, the expansion in education for the less skilled was not nearly as large and the returns to education increased substantially, as did wage inequality.

2.4 The Effect of Relative Demand Shifts on Unemployment

Although there is some agreement about the causes underlying the higher demand for skilled workers across the OECD, there is less consensus about the effect of this trend on unemployment. Krugman (1994) and Freeman (1995) (among others) have suggested the increased demand for skill has created a 'diabolical trade-off' between unemployment and income inequality. In countries where wages are flexible, such as the United States, increased returns to skill have resulted in increased wage and income inequality. In countries like France and Germany, institutional factors have helped maintain wage relativities, but at the cost of high unemployment for unskilled workers who have been priced out of the labour market.

This characterisation however, seems inconsistent with a number of empirical facts. First, the rise in European unemployment has occurred in all labour market groups, not just the unskilled. Second a number of European countries (such as Austria and Norway) with highly regulated labour markets and tight wage relativities enjoy unemployment as low or lower than the United States. Third, even in the United States, unemployment and non-employment is much higher for unskilled workers than for skilled workers; moreover, unskilled unemployment has increased relative to skilled unemployment since the 1970s (Juhn *et al* 1991).

We can use the Nickell and Bell (1995) model outlined previously to compare the effects of a negative aggregate labour demand shock (in which demand falls proportionately for skilled and unskilled labour) and a relative labour demand shock, (in which labour demand falls for unskilled workers, but rises for skilled workers). An example of the latter would be a technology shock that favoured skilled labour. Figure 3 shows the impact of both these types of shocks.

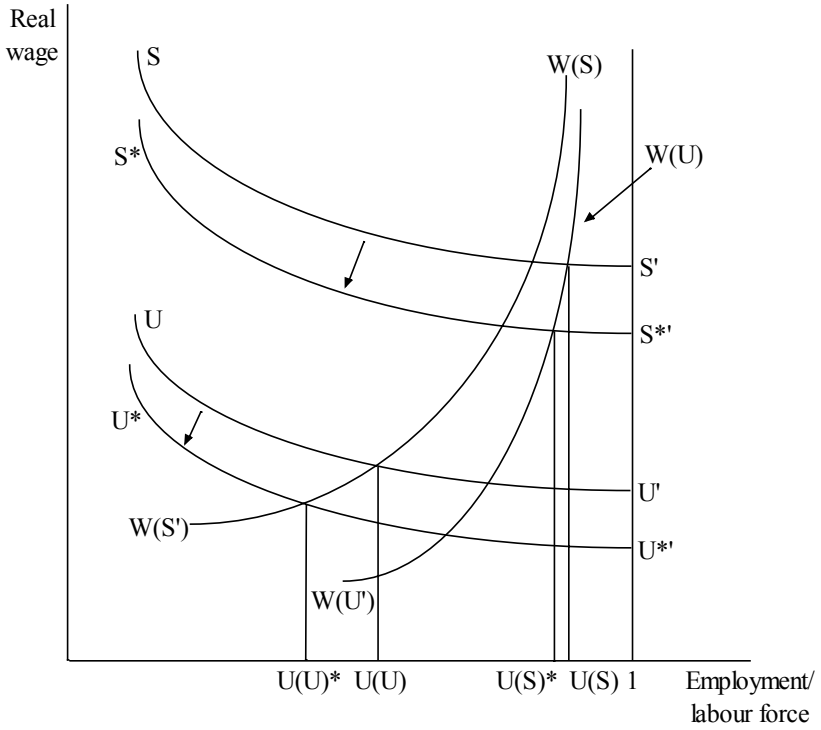
Following the aggregate shock, demand for skilled and unskilled labour shifts downwards proportionally, reducing wages and increasing unemployment for both groups. (An alternative shock that delivers the same outcome would be a proportional upward shift in the wage-setting curve for high-skilled and low-skilled workers.) Note that the absolute increase in the unemployment rate is higher for unskilled workers than for skilled workers, because unskilled workers are presumed to be operating on a flatter part of their wage-setting curve.

In the case of a relative demand shift towards skilled labour and away from unskilled labour, the unskilled unemployment rate increases, and skilled unemployment falls. Since the rise in unskilled unemployment is more pronounced, the aggregate unemployment rate also rises.

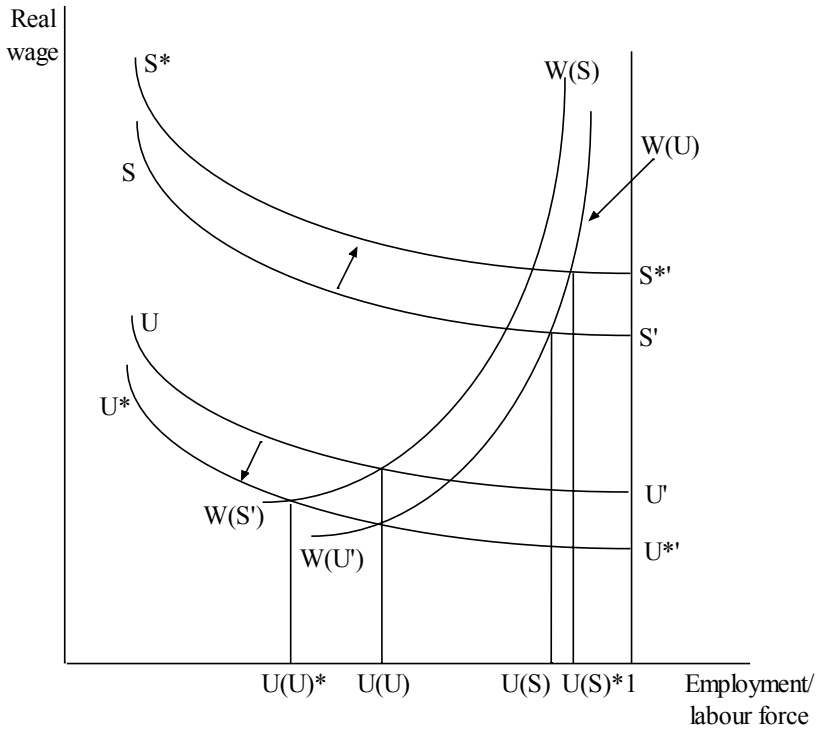
Using this framework, Nickell and Bell estimate that in Great Britain, a neutral shock causing an increase in skilled unemployment of x per cent (e.g. a 10 per cent rise, from 5 per cent to 5.5 per cent) will increase unskilled unemployment by $0.83 \times x$ per cent (e.g. from 10 per cent to 10.83 per cent). They find that only around one-fifth of the rise in the aggregate unemployment rate in Britain between

Figure 3: Effect of Labour Demand Shocks

Aggregate shock



Relative shock



the mid 1970s and late 1980s is explained by a shift in demand against the less-skilled (equivalent to 1.1 percentage points of unemployment). The remainder (which explains a further increase in unemployment of 4.4 percentage points) is explained by adverse aggregate factors. In contrast to Nickell and Bell's findings for Britain, Juhn *et al* (1991) show using data from the Current Population Survey that unskilled unemployment and non-employment rates increased markedly in the United States over the 1970s and 1980s, whilst unemployment rates for skilled workers barely changed.[7] They use these facts to argue that a relative demand shift against unskilled workers was responsible for an apparent increase in the natural rate of unemployment observed in the United States over this period. Differences in the rate of growth in the supply of skilled labour between Britain and the United States may help to reconcile the contrasting evolution of the unemployment structure in the two countries.

What has been assumed for Nickell and Bell's analysis? Firstly, the wage-setting curve must be flatter for unskilled workers than for skilled workers. Nickell and Bell use the following specification for the wage-setting curve:

$$ln(W_i) = \gamma_i - \beta\, ln(u_i) + ln(X) \qquad (1)$$

W_i is the wage for the ith group, γ_i is a wage-setting parameter, u_i is the group's unemployment rate and X is an economy-wide labour productivity parameter.

This functional form is commonly used to model the real wage–unemployment nexus for several reasons. First, the double-log specification ensures that the unemployment rate at the bargained wage outcome cannot fall below zero, since the wage demands of workers increase rapidly as the unemployment rate falls to low values. Conversely, as unemployment rises the curve becomes flatter, as the market wage converges towards individuals' reservation wage. Second, this functional form arises naturally from several non-competitive theoretical models of the labour market, such as a Shapiro and Stiglitz (1984) efficiency wage framework, or a Layard, Nickell and Jackman (1991) markup model. Finally, Blanchflower and Oswald (1994) empirically test the specification in Equation (1)

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[7] Juhn *et al* (1991) measure skill by position in the income distribution. Using an education-based measure of skill, the increase in the wedge between skilled and unskilled unemployment is less obvious, at least over the 1980s (Jackman *et al* 1997).

against a range of alternative functional forms, and generally find that the double-log specification provides the best fit to the data for a range of countries.

More controversially, Equation (1) also implies that the wage-setting curve of less-skilled workers depends on economy-wide productivity (X), rather than the productivity of the group. Consider a shock that increases skilled productivity but decreases unskilled productivity. Demand for unskilled workers shifts downwards, their wage-setting curve – which depends on economy-wide productivity – remains constant, and unskilled unemployment rises. However, if the wage-setting curve depends on the *group's* productivity, then a shift in demand away from unskilled labour has no effect on unemployment, it simply shifts the wage-setting curve downwards for these workers.

Nevertheless, this assumption of Nickell and Bell's does not seem responsible for their finding that only a small part of the rise in aggregate unemployment in Britain is a consequence of a relative demand shift against the unskilled. Jackman *et al* (1997) use a more general framework than Nickell and Bell, which allows for shifts in the wage-setting curves for skilled and unskilled workers in response to movements in relative productivity. They estimate the effect of relative demand shifts on unemployment in Britain to be only 0.5 percentage points.[8] For a number of other countries, the effect of demand shifts on unemployment is even smaller. These results follow quite naturally from the stylised fact that for most countries considered by Jackman *et al*, skilled and unskilled unemployment rates rose almost proportionally during this period. In contrast, a relative demand shift against the unskilled should increase unskilled unemployment, but reduce skilled unemployment. As discussed earlier, Juhn *et al* (1991) provide some evidence that this did occur in the United States; however, it is not evident in most other countries.

In the Nickell and Bell framework, wage rigidity should exacerbate the differential employment effects of labour demand shifts. If the level of low-skilled wages cannot fall, they should experience an even larger decline in employment.

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[8] Another difference between the two studies is that Layard *et al* (1991) use a different definition of a 'neutral' shock, one which requires that a relative demand shift towards the skilled must be matched by a corresponding relative demand shift away from the unskilled. For this reason also, their approach is somewhat more conceptually attractive than Nickell and Bell.

However, Card, Kramarz and Lemieux (1998) present evidence that these forces are weak. They compare employment and wages in the United States, Canada and France. They find that although trends in wages dispersion were very different across the three nations, shifts in employment were quite similar. Nickell (1996) suggests a possible explanation for this surprising result. He presents evidence that the level of basic literacy and numeracy is much higher in continental Europe than in either Great Britain or the United States – the two countries generally singled out as having large falls in wages for the unskilled. Thus, 'low-skilled' workers in France were better able to cope with a fall in demand for unskilled labour because of their higher level of basic education, and also perhaps their greater opportunities to complete higher education. In this respect (though clearly not in aggregate unemployment outcomes), continental Europe has outperformed many flexible wage countries, in coping with a relative demand shift against the unskilled without engendering a massive fall in the relative wages of less-skilled workers.

3. The Australian Labour Market Disaggregated by Skill

We now summarise the labour market position of skilled and unskilled workers in Australia.[9] Given available data, we generally measure skill either by educational attainment or occupation. Clearly other dimensions of skills are important as well since, as documented in Borland (1998), increases in earnings inequality in Australia can be attributed not at all to increasing returns to education or other observable skill characteristics (such as experience), but to increased dispersion within education and skill groups. This suggests that changes in demand and supply for unobservable skill characteristics have been important, and that correspondingly our aggregate measures of skill provide only a partial picture.

3.1 Employment

Whether measured by educational attainment or occupation skill level, employment of skilled labour has increased substantially over the past two decades (Figure 4). In particular, employment of tertiary educated workers has increased rapidly since 1979, and accounts for virtually all the employment growth since that time.

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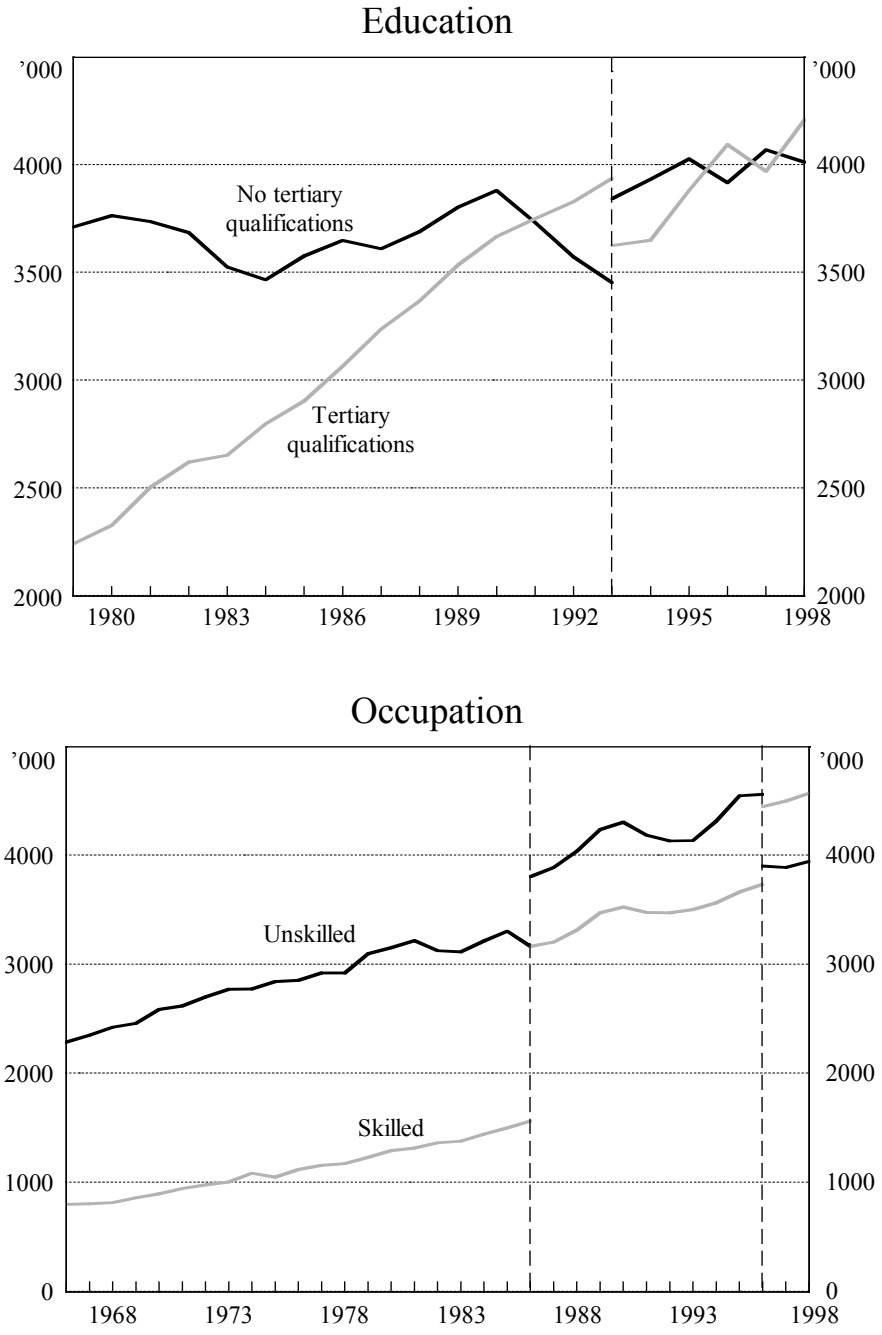
9 Our discussion is drawn in part from the evidence presented in Debelle and Swann (1998).

Figure 4: Employment by Educational Attainment and Occupation Group



Sources: *Transition from Education to Work*, ABS Cat. No. 6227.0, various issues. *Labour Force Status and Educational Attainment*, ABS Cat. No. 6235.0, various issues. *Labour Force, Australia*, ABS Cat. No. 6203.0, various issues. There is a structural break in the educational attainment data in 1993 due to the change in survey from ABS Cat. No. 6235 to ABS Cat No. 6227.0 and to a change in the classification of some courses by the ABS. There are structural breaks in the occupation data in 1986 and 1996 due to reclassification of occupation groups. See Appendix A for detailed definitions of skill by education and occupation.

Data on employment by occupation are available from 1966 onwards, a much longer time series than employment by educational attainment. However, several problems arise when classifying skill according to occupation. First, workers are classified by occupation based on the last full-time position held in the previous three years. Thus, part-time workers, and unemployed persons who have either never held a job, or have not recently worked full-time, are excluded. Second, occupation groupings were completely reclassified in 1986 and in 1996, making comparisons over time difficult. Third, prior to 1986 a single occupation group covered both tradespersons (generally classified as skilled labour) and labourers and production workers (usually classified as unskilled). As a result, this occupation group (representing a substantial 27 per cent of total employment in 1986) has been excluded from calculations of skilled and unskilled employment – which explains the upward jump in both skilled and unskilled employment after 1986 in the lower panel of Figure 4.

Notwithstanding these problems, Figure 4 illustrates that employment grew faster in high-skilled occupations (currently defined as managers and administrators, professionals, associate professionals, tradespersons and advanced clerical workers).[10] However, the difference between skilled and unskilled employment growth is not nearly as large as when skill is indexed by educational attainment. Comparing growth rates for consecutive years when occupation classifications did not change, growth in skilled employment averaged 2.8 per cent, compared with 1.9 per cent for unskilled employment.

Is this observed increase in skilled employment driven by demand or supply factors? Several authors have tested whether the behaviour of wages, employment and labour supply in Australia is consistent with a stable set of labour demand equations across skill groups. These tests have generally found a consistent increase in the demand for educated labour (Borland and Wilkins 1997) and high-skill occupations (Gregory 1993) since the 1970s. However, the supply of skilled labour also increased substantially over this period, helping to contain wage relativities between skill groups.

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[10] The Australian Standard Classification of Occupations (ASCO) ranks occupation grouping from 1 to 5 according to skill level (where 1 is the most skilled). We deem occupation groups with a ranking of 1, 2 or 3 to be skilled.

3.2 Unemployment

The unemployment rate for individuals with tertiary qualifications is nearly six percentage points below the rate for those with no post-school qualifications. That less-educated individuals have a high unemployment rate is not, however, a recent phenomenon; it has been a feature of the data since the beginning of the sample period. Also, unemployment rates across education groups have fluctuated in a relatively synchronous fashion.

Our education data unfortunately do not cover the mid 1970s, the period generally associated with the increase in the estimated natural rate of unemployment in Australia.[11] However, data by occupation group, which does include this period, present a picture consistent with the education data. Both skilled and unskilled unemployment exhibit a strong upward trend since the 1960s, but in the short run movements in both unemployment rates are dominated by changes in the business cycle. Also, skilled unemployment has been consistently much lower than unskilled unemployment, although the percentage point difference between the two rates has increased over time. Since many of those excluded from the occupation data (part-time workers and individuals with no recent employment history) have a high propensity to be unemployed, both the skilled and unskilled unemployment rates shown in Figure 5 are lower than the actual aggregate unemployment rate.

Using the Nickell and Bell (1995) framework outlined in Section 2, we can make a rough estimate of the relative importance of aggregate and relative shifts in labour demand on unemployment. We ask the following question: *How much would the unskilled unemployment rate have increased following an aggregate shock big enough to cause the observed increase in the skilled unemployment rate?* By an aggregate shock, we mean a proportional upward shift in the wage-setting curve for both skilled and unskilled workers.

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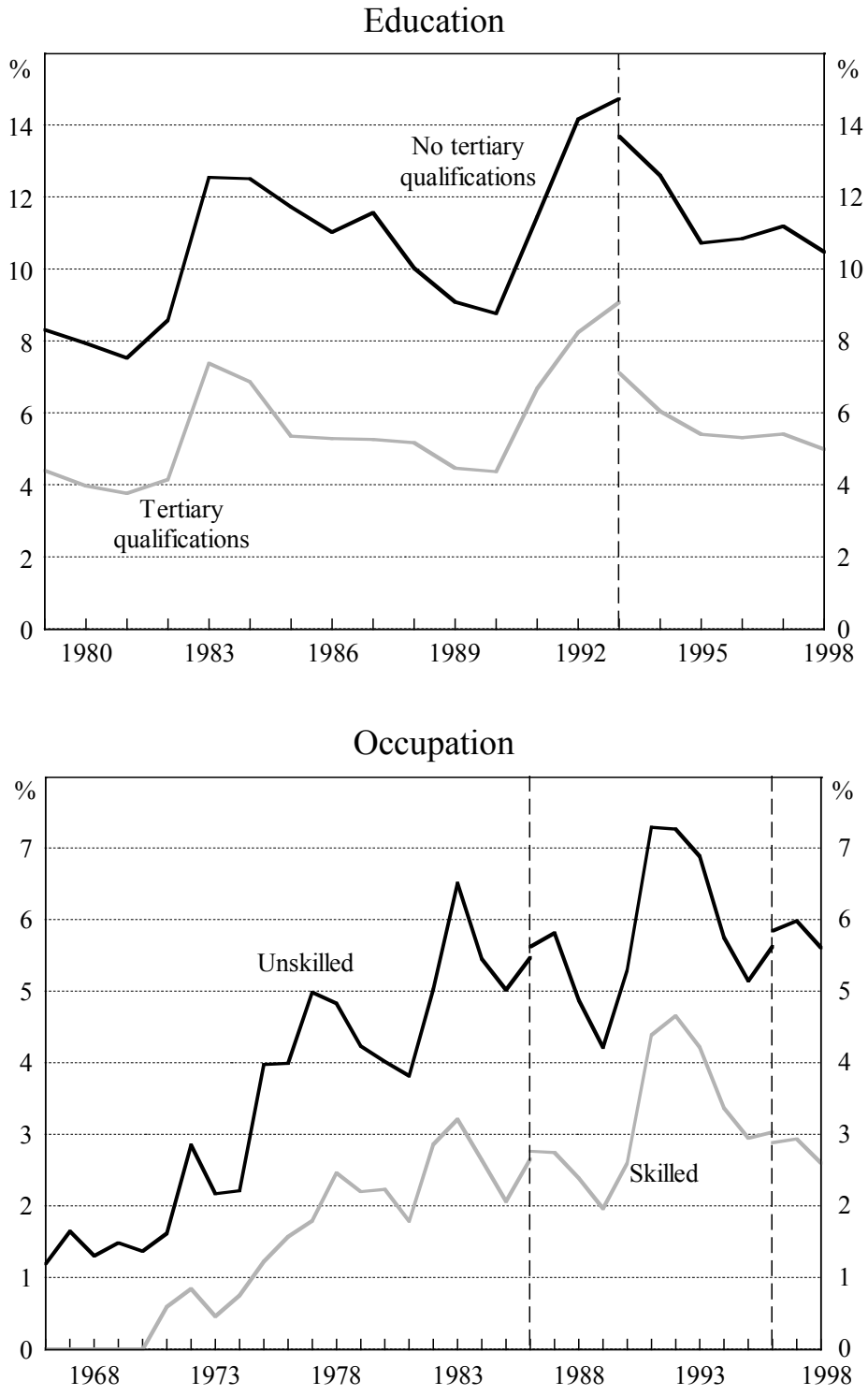
[11] See Debelle and Vickery (1998) for a summary of natural rate estimates in Australia.

Figure 5: Unemployment by Occupation and Educational Attainment



Sources: See Figure 4.

From the previous section, we have showed that an aggregate shock of this nature will tend to increase unskilled unemployment more than skilled unemployment. Assuming a CES production function and a competitive product market, Nickell and Bell show that the elasticity of unskilled unemployment with respect to skilled unemployment following an aggregate shock is given by:

$$\frac{\partial \log u_u}{\partial \log u_s} = \frac{\eta(u_s) + u_s/[\sigma(1-u_s)]}{\eta(u_u) + u_u/[\sigma(1-u_u)]} \tag{2}$$

where u_s and u_u are skilled and unskilled unemployment rates, $\eta(u_s)$ and $\eta(u_u)$ are the unemployment elasticities of wages for skilled and unskilled workers and σ is the elasticity of substitution between skilled and unskilled workers.

We assume there is a common upward shift in the wage-setting curve sufficient to cause the increase in unemployment that was actually observed for degree qualified individuals. Equation 2 allows us to calculate how this increase in unemployment would be expected to affect the other three education groups.

Given that the occupation skill measure excludes a large proportion of the workforce, we focus on education measures for this exercise. We disaggregate the labour force by sex, and into four educational groups: (1) bachelor's degree or higher qualification, (2) non-degree post-secondary qualification, such as a trade certificate or undergraduate diploma, (3) completed high school, but no further qualifications, and (4) did not complete high school. Individuals still at school are excluded. There is a structural break in the education data due to the change in survey from ABS Cat. No. 6235.0 to ABS Cat. No. 6227.0, and thus our data period finishes in 1994.

To apply Equation (2) to the data, we need estimates of $\eta(u_s)$, $\eta(u_u)$ and σ. Clearly, estimating these parameters is a substantial task, and we make no independent attempt to do so here. Instead, we use estimates from other studies to calibrate our model. To our knowledge, there are no Australian estimates of the elasticity of substitution between different education groups. Hamermesh (1993) provides a summary of estimates of this elasticity from a range of overseas studies. Nickell and Bell's reading of this evidence leads them to choose an elasticity of 3, although

this is substantially higher than some other estimates.[12] We might also expect a greater degree of substitutability between similar labour market groups (e.g. between university-educated and non-degree-tertiary-educated individuals).[13] In the results presented here, we set $\sigma = 3$. However, the results barely change when a lower estimate is used, or when different estimates are used for different groups.

Blanchflower and Oswald (1994) estimate the elasticity of earnings with respect to the unemployment rate for Australia. Using data from the 1986 Income Distribution Survey, they find an elasticity of –0.19, based on cross-sectional differences in unemployment rates across Australian states. Kennedy and Borland (1997) re-estimate these results using pooled data from four Income Distribution Surveys and including dummy variables for state of residence. They find an elasticity of –0.073, somewhat smaller than Blanchflower and Oswald. We use this latter estimate as the wage elasticity for each of the education groups.

Based on these estimates, we are now in a position to calculate the predicted effect of an aggregate wage-setting shock on unemployment for the other three education groups. We compare our predictions to actual experience. Results are presented in Figure 6.

Over this period, the evolution of unemployment across different education groups can be explained almost entirely by changes in the aggregate unemployment rate. The actual and predicted unemployment rates track each other quite closely for every education group. This is consistent with a series of aggregate labour market shifts that increased the overall unemployment rate, but left the structure of unemployment rates across education groups basically intact.

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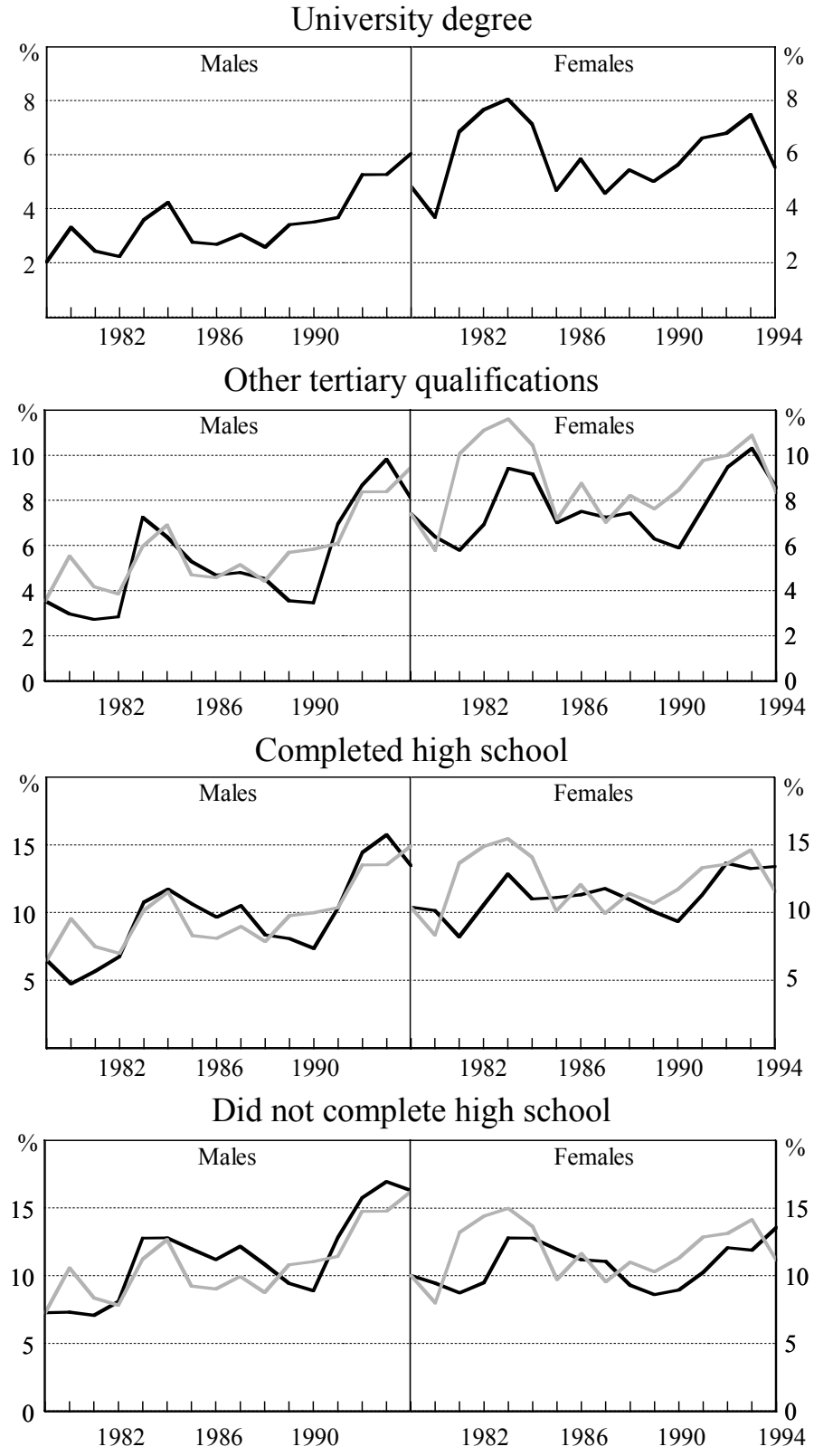
[12] By way of contrast, Jackman *et al* (1997) find the elasticity of substitution between educated and uneducated labour to be consistent with a Cobb-Douglas production function, implying an elasticity of unity. So clearly there is a large degree of uncertainty regarding the appropriate elasticity – as illustrated by the wide range of estimates provided in Hamermesh's Table 3.8.

[13] Alternatively, there may be asymmetry in substitution between different groups – an educated individual may be a good substitute (in most cases) for someone who has not completed high school, although the converse would not generally be true.

Figure 6: Unemployment and Aggregate Wage Pressure



Notes: Black line is actual unemployment; grey line is predicted unemployment

As mentioned above, our findings are not sensitive to changing the elasticity of substitution between skill groups. However, the results are quite sensitive to our estimate of the wage elasticity ($\eta(u)$). Borland and Kennedy's preferred estimate of –0.073 is estimated with a considerable degree of uncertainty (the reported standard error on this estimate is 0.04). We tested the robustness of our results to changes in this estimate. We also experimented with different elasticities for different skill groups. Increasing the wage elasticity to a large number (e.g. –0.2 or –0.3) made some differences to our results, but did not alter our substantive conclusions. But lowering the elasticity to a very small value does make a substantial difference; the predicted rise in less-educated unemployment is much smaller. For example, if we set the elasticity at –0.01, the predicted rate for males who did not complete high school is only 12.2 per cent at the end of the sample period, compared with an actual rate of 16.3 per cent.

One further limitation of this exercise is that our data only begin in 1979. Most studies suggest that the increase in the natural rate of unemployment in Australia occurred prior to this, in the early to mid 1970s (Debelle and Vickery 1998). However, although we have no education data for the 1970s, a visual inspection of the data on unemployment by occupation in Figure 5 does not suggest that low-skilled unemployment increased disproportionately over this period.

How can these findings about the stability of relative unemployment rates be reconciled with the large increase in the demand for skilled labour that occurred over this period? The answer is that during this period, the supply of educated labour increased rapidly, broadly keeping pace with the increase in demand. Consistent with this explanation, wage relativities across skill groups remained fairly constant between the late 1970s and early 1990s (as shown below).

Our results are consistent with Nickell and Bell (1995) and Jackman *et al* (1997), who find that the increase in unskilled unemployment in a range of OECD countries can be explained mainly by aggregate factors which also caused an increase in skilled unemployment. Murphy (1995) and Katz (1998) have offered a possible explanation for the substantial rise in measured skilled unemployment in these countries, even in the presence of strong SBTC. This explanation relies on the difficulty of measuring skill, and the likelihood that education provides only a noisy indicator of it. Then, high unemployment among a small group of highly

educated but low skilled workers could explain why the unemployment rate of highly educated workers has increased. Furthermore, labour market policies which artificially maintain wage relativities *within* education and occupation groups could lead to an increase in unemployment in all groups, especially if there are generous unemployment benefits which discourage the unemployed skilled workers from competing for the less skilled jobs.

3.3 Wages

Borland (1998) presents evidence on pre-tax earnings according to educational attainment using data on individuals from the Income Distribution Survey. These data suggest that the earnings premium attached to a university degree actually declined substantially during the 1970s, but has remained fairly constant since that time. In 1968/69, average earnings for a university-educated male worker were 2.4 times those of a worker who had not completed secondary school. By 1978/79 this ratio had dropped to 1.9, and by 1989/90 had stabilised at around 1.8 (based on annual earnings). A similar reduction in educational premium can be observed for women (a summary of Borland's data is presented in Table 1).

Borland also decomposes changes in inequality of weekly earnings between 1982 and 1994–95 into changes in observable factors (education and years of experience) and unobservable factors (the remainder). He finds that the returns to education and experience fell by a small amount over the period. Earnings inequality increased somewhat for both males and females; however, this was due entirely to changes in unobservable factors.

Borland does not control for occupational skills as part of his set of observable characteristics. Table 2 presents data on the evolution of relative wages across occupational groups since 1975.

Table 1: Average Relative Earnings by Level of Educational Attainment
Full-time workers: 1968/69 to 1989/90, relative to those who did not complete high school

	University Degree	Trade qualification/ Diploma	Completed high school	Not completed high school
Males				
1968/69	235.2	131.2	113.9	100.0
1973/74	207.8	124.9	111.9	100.0
1978/79	187.1	121.1	108.4	100.0
1981/82	178.9	117.1	99.1	100.0
1985/86	171.2	122.1	105.2	100.0
1989/90	180.4	120.4	107.4	100.0
Females				
1973/74	208.1	135.8	109.7	100.0
1978/79	169.8	124.3	109.2	100.0
1981/82	174.3	121.6	109.5	100.0
1985/86	167.9	124.8	109.0	100.0
1989/90	170.4	125.2	105.4	100.0

Notes: Reproduced from data in Borland (1998), Table 8.

More-skilled occupational groups (managers and administrators, professionals and para-professionals) clearly enjoy a substantial wage premium over less-skilled workers. However, there is little evidence that this premium has increased over time. Our analysis is made more difficult by the change in classification of occupations in 1986. From 1975 to 1985 the earnings of several low-paid male occupations (service, sport and recreation, and tradepersons and production workers) actually improved relative to professional and managerial salaries. Between 1986 and 1995 there was no clear trend; wages for some low-paid occupations (such as salespersons) improved relative to professionals, while others declined. For women, there was some increase in the wage premium for managers/administrators and para-professionals compared with other groups. However, once again, there is no clear pattern suggesting an increasing premium for skill.

Thus, data on wages by educational attainment, experience and occupation suggest little evidence of a widening in earnings across skill groups. The increase in

income inequality that did occur over the last two decades, is attributable to a widening distribution of incomes within skill groups due to unobservable factors.

Table 2: Wages for Full-time Workers by Occupation
Relative to the wage of professionals

	Males			Females		
	1975	1980	1985	1975	1980	1985
Professional and technical	100	100	100	100	100	100
Administrative, executive, managerial	104	102	99	97	96	92
Clerical	74	75	76	75	74	74
Sales	73	72	72	66	62	62
Transport and communications	73	78	81	75	79	77
Tradesmen, production workers	68	70	72	66	65	64
Service, sport, recreation	69	76	75	68	68	66
Farmers, fishermen, timbergetters	57	58	56	59	51	54
	Males			Females		
	1986	1990	1995	1986	1990	1995
Professionals	100	100	100	100	100	100
Managers and administrators	100	98	99	91	98	102
Para-professionals	86	82	86	80	87	88
Clerks	71	72	72	68	72	72
Salespersons and personal service workers	69	72	72	58	63	66
Plant and machine operators	72	73	71	58	61	57
Tradespersons	68	67	64	57	60	58
Labourers and related workers	61	62	58	59	58	56

Notes: Wages for full-time workers in main job. Earnings between 1975 and 1985 are indexed to the 'Professional and technical' group. The occupational classifications were re-defined in 1986, after which wages are indexed to the 'Professionals' occupational group. Occupational groups are not directly comparable between these two periods. Occupational groupings were re-classified again in 1996. The new groupings are excluded from the above table, since only one set of results using the new classifications is publicly available.

Source: Weekly Earnings of Employees (Distribution), Australia. ABS Cat. No. 6310.0

3.4 Summary

Our reading of the evidence suggests the following:

1. Labour demand for educated labour in Australia has increased rapidly since the 1970s, consistent with trends in other countries. Employment has also increased in skilled occupation groups, although this increase has not been as pronounced as the increase in demand for the highly educated. Although overseas evidence suggests the increased demand for skill has been driven largely by skill-biased technological progress, not enough evidence exists for Australia to make definitive statements about the causes of the demand shift.

2. Despite the shift in demand towards skilled labour, the structure of unemployment rates across skill groups has remained substantially unchanged. Thus, changes in labour supply have basically kept pace with demand shifts. The increase in unemployment rates across all education and occupation groups is consistent with an aggregate shift in wage-setting. This is consistent with the experience of a number of other countries (for example, Canada and Britain), although the United States did experience a disproportionate rise in unskilled unemployment over the past two decades.

3. Wage relativities between education, experience and occupation groups became more compressed over the 1970s, but remained fairly constant over the 1980s and early 1990s. Once again, this is consistent with our hypothesis that movements in unemployment rates reflect aggregate, rather than group-specific factors. Earnings inequality did increase over this period; however, this was not due to an increase in returns to observable skill factors.

4. Why is Unskilled Unemployment Higher?

The evidence presented in the previous two sections demonstrates that unemployment rates are generally much higher for unskilled workers than for skilled workers, both in Australia and overseas. Why this should be the case is not

immediately obvious. A simple competitive model predicts that lower unskilled productivity should be reflected in correspondingly lower wages (and perhaps lower labour-force participation rates), and not in higher unemployment. Moreover, a number of non-market-clearing models of the labour market contain features that actually predict that skilled unemployment should be *higher* than unskilled unemployment. For example, skilled work may be more difficult to monitor effectively than unskilled work, which in a worker-discipline model (e.g. Shapiro and Stiglitz 1984) would imply a greater incentive to shirk among skilled workers, leading to higher unemployment for this group. Alternatively, we might expect the wage distribution of job offers to be wider for a skilled worker than for an unskilled worker. In a search framework such as Pissarides (1990), this would lead skilled workers to reject job offers which do not provide a good fit to their skills set, increasing skilled unemployment.[14]

4.1 Transition Probabilities

One plausible reason why unskilled unemployment is relatively high is that unskilled workers have less firm-specific human capital than skilled workers. Since firm-specific human capital is dissipated when skilled workers leave employment, they, and their employers, have an incentive to reduce such separation. As a result, the separation rate (the rate at which currently employed workers leave employment) is higher for unskilled workers. This in turn leads to a higher equilibrium unemployment rate for this group.

A useful exercise to help appraise this and other explanations for the large steady-state differences between unemployment rates is to examine gross flows between labour market states for different skill groups. We calculate these flows using data on individuals from the Survey of Employment and Unemployment Patterns (SEUP).[15] The SEUP survey, as well as containing a large sample of job-seekers, also includes a Population Reference Group of 2 311 individuals, designed to reflect the labour market characteristics of the population as a whole.

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[14] This conclusion is less convincing if we consider a model that allows workers to search for new jobs while employed (Pissarides 1994).

[15] The SEUP survey was conducted in a series of 'waves'. An interview was conducted during each wave, during which the respondent provided details of their job-search activities over the previous twelve months. In this paper we use data from Wave 1 and Wave 2, covering labour market experiences from September 1994 to September 1996.

From these data, we calculate the average probability of moving between three labour market states (employment, unemployment and out of the labour force). We calculate this for four different levels of educational attainment: bachelors degree or above, non-degree tertiary education, completed high school and did not complete high school. Average transition probabilities over Wave 1 and Wave 2 are presented in Table 3.

Table 3: Monthly Transition Probabilities by Educational Attainment

Degree level education or higher

	Em	*Un*	*Nilf*
Em	99.0%	0.4%	0.6%
Un	16.8%	77.2%	6.0%
Nilf	7.1%	3.3%	89.7%

Other tertiary education

	Em	*Un*	*Nilf*
Em	98.8%	0.5%	0.7%
Un	10.9%	86.6%	2.5%
Nilf	3.4%	2.0%	94.6%

Completed high school

	Em	*Un*	*Nilf*
Em	97.9%	0.9%	1.2%
Un	10.5%	86.9%	2.6%
Nilf	4.2%	2.4%	93.4%

Did not complete high school

	Em	*Un*	*Nilf*
Em	98.0%	1.0%	0.9%
Un	8.9%	89.0%	2.0%
Nilf	1.9%	1.4%	96.7%

Notes: Old labour force status is listed down the column, new labour force status is listed across the row, monthly probabilities**.** Transition probabilities are measured as the average proportion of individuals in one labour market state that shifted to a particular other state over the period between two reference points a month apart.

Consistent with the gross flows data in the Labour Force Survey, data in Table 3 are presented in the form of monthly transition probabilities, ie. by comparing the labour force status of a worker from one month to the next. The overall magnitude of these flows is consistent with the Labour Force Survey.

There are several differences between the transition probabilities for skilled and less-skilled labour. Firstly, transitions from employment to unemployment occur much more frequently for less-educated workers. An individual who did not complete high school is 2½ times more likely to enter unemployment from employment over the course of a month than is an employed degree educated individual. Furthermore, the probability of an unemployed university graduate

finding employment over the course of a month is 16.8 per cent, compared with 10.0 per cent for those with other tertiary qualifications, and 8.9 per cent for unemployed individuals who had not completed high school. Since more-educated individuals also have a higher transition rate from unemployment to outside the labour force, the duration of unemployment is therefore substantially longer for a less-educated individual.[16]

We are now in a position to examine to what extent differences in transition probabilities between education groups account for differences in unemployment rates between these groups. In equilibrium, the number of employed, unemployed and non-participating individuals remains constant (given a constant sample size). Following the approach of Foster and Gregory (1982), we can use this property to calculate the steady-state unemployment rate for each group as a function of transition probabilities, as shown below. (Appendix B explains in more detail how this expression is derived.)

$$ur = \frac{(nu/ne)(en+eu)+eu}{ue(1+nu/ne)+(nu/ne)(en+eu)+eu+un} \tag{3}$$

We then calculate the marginal impact of the individual transition probabilities on the overall unemployment rate for each education group. To do this, we replace the relevant transition probability for one group of workers (say 'completed high school') with the relevant transition probability from the 'bachelors degree or higher' group. We then calculate a new steady-state unemployment rate for the group, and compare it with the original steady-state unemployment rate. This approach allows us to examine the marginal impact of each transition probability or sets of transition probabilities on the different steady-state unemployment rates.

A summary of these results is presented in Table 4. In steady state, the 'completed high school' unemployment rate is 7.1 percentage points above the unemployment rate for degree educated individuals, while the 'did not complete high school' rate is 9.6 percentage points higher than the degree rate. However, if the job separation rate (the sum of transition rates from employment to unemployment and

[16] The average completed duration of unemployment in months is equal to $1/[\mathrm{P}(un \rightarrow emp) + \mathrm{P}(un \rightarrow nilf)]$.

Table 4: Contribution of Transition Probabilities to Unemployment Differentials, September 1994 – September 1996

Summary of results, percentage points of unemployment

	Other tertiary	Completed high school	Not completed high school
Steady-state difference from degree unemployment rate	2.8%	7.1%	9.6%
Marginal effect of transition probabilities:			
Employment to unemployment (*eu*)	0.5%	3.2%	5.1%
Employment to outside the labour force (*en*)	0.4%	1.7%	1.1%
Job separation rate (eu and en)	*0.9%*	*5.0%*	*6.4%*
Unemployment to employment (*ue*)	1.7%	3.1%	5.0%
Not in labour force to employment (*ne*)	0.9%	1.2%	2.2%
Job matching rate (ue and ne)	*2.3%*	*3.9%*	*6.2%*
Transitions between unemployment and not in the labour force (un and nu)	*–0.04%*	*0.6%*	*–0.4%*

Notes: Values in this table represent the marginal impact of each transition probability or set of transition probabilities on the group steady-state unemployment rate. These are calculated by replacing the transition probability for the education group with the corresponding probability for degree-educated individuals. A full set of results and a more complete explanation of the method used are presented in Appendix B.

employment to outside the labour force) was the same for these groups as for the degree educated group, these steady state unemployment differences would fall to 3.2 percentage points and 2.1 percentage points respectively.[17] Mostly, this difference reflects differences in the transition rates from employment to unemployment between education groups.

Alternatively, if the matching rate (the rate at which non-employed workers are matched to jobs) were the same for all education groups, the steady state unemployment differences would fall to 0.5, 3.2 and 3.4 percentage points for the non-degree-tertiary-educated, completed high school and not completed high

[17] Calculated as 7.1 – 5.0 = 2.1 percentage points, and 9.6 – 6.4 = 3.2 percentage points.

school groups respectively. Partially, this is because less-educated individuals have a lower probability of entering the labour market successfully (i.e. that they are more likely to move from outside the labour market to unemployment, rather than into employment). We can calculate the probability of a successful entry into the labour market – that is, into a job rather than the unemployment pool – as:

$$\text{Probability of successful entry} = \frac{P(nilf \rightarrow emp)}{P(nilf \rightarrow emp) + P(nilf \rightarrow un)} \quad (4)$$

where $P(nilf \rightarrow emp[un])$ is the conditional probability of moving from outside the labour force to employment [unemployment]. Sixty-eight per cent of degree-educated workers entering the labour force during a month find employment by the end of the month. This falls to 64 per cent for those with non-degree tertiary qualifications, 63 per cent for those who have completed high school but gone no further, and 59 per cent for individuals who have not completed high school.

Differences in transition rates between unemployment and outside the labour force play a more minor role in accounting for unemployment differentials. Note that since the relationship in Equation (2) is not linear, the marginal effects of individual transition probabilities shown in Table 4 are not additive. That is, the sum of the effects of changing (for example) the *ue* and *ne* transition probabilities individually is different from the effect of changing *ue* and *ne* at the same time.

We conclude that the high unemployment of less-educated workers can be attributed to two main factors: (i) a less-educated worker has a greater probability of exiting employment each period (a high 'separation rate'), and (ii) once not employed, a less-educated worker has a smaller probability of finding employment (a low 'matching rate'). These two influences are of approximately equal importance. In contrast, Foster and Gregory (1982), who use the same framework, find that separation rates alone explain nearly all the difference in unemployment rates between teenagers and adults over the year ended June 1980. Our findings suggest that across education groups, both separation and matching rates are important for explaining unemployment differentials.

Although these results are revealing, they are limited in several respects, and a number of extensions exist for future research. Firstly, the SEUP survey on which

our results are based consists of a relatively small sample of only 2 311 individuals. The sampling error associated with our estimates could be substantial. Secondly, transition probabilities fluctuate substantially over the course of the business cycle (Blanchard and Diamond (1990), and Debelle and Swann (1998) for recent Australian evidence). With only two years of data, we have no satisfactory way of accounting for this cyclicality. We can gain some comfort from the fact that the average output gap over the period of our data, September 1994 to September 1996, was quite close to zero (based on the estimates in de Brouwer (1998)), suggesting that the observed transition probabilities were close to the equilibrium probabilities. A third caveat is that each of the transition probabilities are related. It would certainly not be possible in practice to change one transition probability without affecting each of the other probabilities at the same time. A more comprehensive study might try and explain the transition probabilities in terms of deeper structural variables, rather than treating them as exogenous (in the spirit of Mortensen and Pissarides (1994)).

4.2 Explanations

We are now in a position to discuss and evaluate possible explanations for the high rate of unskilled unemployment. We consider four commonly cited explanations below. The first explanation is more relevant for explaining differences in separation rates across skill groups, the other three explanations may help to explain why the matching rates of unskilled workers are lower than for skilled workers. We present relevant empirical evidence where possible, but given available data it is difficult to determine with any degree of certainty which explanation is most important.

4.2.1 Firm-specific human capital

Unskilled workers are generally thought to have less human capital, and in particular less firm-specific human capital, than skilled workers (Nickell and Bell 1995). An individual with firm-specific skills has a high value to the firm relative to their market value; in a search framework, separations between workers and jobs will occur less frequently for these workers. Thus, we might expect the separation rate of workers from jobs to be higher for less-skilled labour market groups. Certainly, this expectation is consistent with our data on transition probabilities.

Less-skilled workers have much higher exit probabilities from employment, both into unemployment and to outside the labour force.

We might also expect a high degree of firm-specific capital to increase the amplitude of fluctuations in unskilled unemployment rates relative to skilled rates. During recessions firms will hoard the human capital embodied in their skilled labour force, and instead shed unskilled labour. The evidence for 'excess amplitude' in unskilled unemployment is, however, weak. We de-trend the unemployment rates for different education groups (from the information presented in Figure 6), and calculate the standard deviation for each group in turn. We compare this to the degree of variability predicted by the Nickell and Bell model. Since the Nickell and Bell framework does not take hoarding of skilled labour into account, the actual standard deviation should rise relative to the predicted standard deviation for less-educated groups.

A summary of these results is presented in Table 5.

Table 5: Standard Deviation of Unemployment

	Males		Females	
	Actual	Predicted	Actual	Predicted
University Degree	0.77	0.77	1.26	1.26
Trade/Diploma	1.66	1.14	1.25	1.68
Completed high school	2.17	1.63	1.24	2.04
Not completed high school	2.05	1.73	1.53	2.00

Note: These are the de-trended standard deviations of unemployment for each skill groups, from the data presented in Figure 6.

For males, it is certainly true that the standard deviation of unemployment rates increases as the level of skill falls, and more so than would be predicted by the Nickell and Bell framework. However, for females the opposite is true. Not only is the actual unemployment standard deviation less than predicted, but even the stylised fact that unemployment rates are more variable for the less-skilled does not hold true for females (except for the not completed high school group).

Thus, the evidence is somewhat mixed. The high separation rates for unskilled workers are consistent with an explanation based on firm-specific human capital.

However, other explanations for high unskilled unemployment must be at least equally important, since differences in separation rates explain only part of the unemployment differences between skill groups. The following three explanations may all help to explain why the matching rate of workers to jobs is higher for skilled labour than for unskilled labour.

4.2.2 Skilled labour performing unskilled jobs

Skilled workers are able to search for both skilled and unskilled jobs, whereas unskilled workers do not have this luxury. Thus, a skilled worker who is unable to obtain employment in their area of specialisation can 'trade down' to a less-skilled position while continuing to search for a skilled job. In a search model that permits on-the-job search, this will reduce the equilibrium unemployment rate of skilled workers by increasing the matching rate of workers to jobs. However, as McCormick (1990) argues, skilled workers may be unwilling to accept unskilled employment even for short periods of time due to fears of stigmatisation.

Data from the SEUP survey give an indication of the proportion of workers who are 'overqualified' for the position they hold. Table 6 compares the highest level of education obtained by employed workers to the level of education actually required to do their job. As expected, a substantial majority of degree-educated workers have employment requiring a degree qualification. However, some 18 per cent of these workers hold employment which require no qualifications whatsoever. Moreover, 63 per cent of those with other post-school qualifications such as a trade qualification or undergraduate diploma have employment requiring no qualifications. Hecker (1992) finds an identical result – that 18 per cent of US college graduates are working in unskilled jobs. However, Tyler, Murname and Levy (1995) show that many of these are young workers who subsequently find employment in a skilled career path.

We also used the SEUP data to examine whether educated workers in 'uneducated' jobs tend to then move into an 'educated' job. The available data suggest that this is not the case – these workers predominantly remain in unskilled jobs despite their

Table 6: Highest Level of Education and Level of Education Required for Job

Highest level of Education	Level of qualifications required for job				
	Degree	Post-school	High school	No quals.	Obs.
Degree	69%	12%	1%	18%	43
Post-school	2%	33%	1%	63%	99
High school	0%	16%	7%	77%	85
NCHS	0%	6%	6%	88%	135
Obs.	31	55	17	259	362

Notes: Sample is all employed people at the end of Wave 1 who are in the population reference group, and who answered the questions 'What is your highest level of educational attainment?' and 'What level of education is required for your job?'. Only the primary job of each respondee is included. The number of observations is the raw number of respondees. The percentages have been weighted using the population reference group weights supplied in SEUP so that the sample reflects the characteristics of the labour force as a whole, rather than the sampling characteristics of the SEUP survey.

high education level. However, in making this calculation our sample size becomes so small that we are unable to draw any firm conclusions.[18]

Okun (1981) argues that the 'crowding out' of unskilled jobs by skilled workers will also change the composition of unemployment across skill groups over the business cycle. In his model, wages are sticky, and so employers adjust the hiring standard instead – thus giving a higher share of unskilled jobs to skilled labour when unemployment is high. Van den Berg *et al* (1998) test for the existence of cyclical crowding out of unskilled workers using firm-level data from the Netherlands. They find no evidence that skilled workers replace unskilled workers disproportionately during recessions. However, they do find that the average education level of workers in all job types increased in the Netherlands over the first half of the 1990s, perhaps suggesting that credential creep was occurring.

The evidence that a substantial number of workers (especially in the non-degree tertiary education group) are overqualified for the jobs they hold may reflect

[18] Our approach is to observe the proportion of workers with post-school education who are working in jobs requiring no qualifications whose next job requires post-school qualifications. Unfortunately, due to the high non-response rate to the questions required for this calculation, we are left with only 18 observations. Of these 18 workers, 16 remained in a non-qualification job, and only 2 shifted to a job requiring post-school qualifications.

crowding out of less-skilled jobs by overqualified workers. Unfortunately, we are unable to examine how crowding out varies over the cycle. Ideally, we would like data on how matching rates by education group vary as the unemployment rate fluctuates; using such data, we could test whether the degree of 'credential creep' increases when the unemployment rate is high, as the Okun (1981) hypothesis would imply.

4.2.3 Replacement ratios

The replacement ratio (the ratio of a person's unemployment benefit to the wage they would earn if employed) is often used to measure the relative incentive of an unemployed person to search for work. In a search model like Pissarides (1990) the size of the replacement ratio is positively related to the equilibrium unemployment rate. Other authors have highlighted the duration of benefits as a factor which reduces search intensity (e.g. Layard, Nickell and Jackman 1991), and thus reduces the matching rate of workers to jobs.

Since the level of unemployment benefit paid in Australia is not related to previous income, and since skilled wages are substantially higher than unskilled wages, the replacement ratio will be higher for unskilled workers than for skilled workers. Dawkins, Harris and Loundes (1998) find a higher replacement ratio to significantly reduce an individual's probability of being in employment (conditional on other worker characteristics), using longitudinal data on Australian female youth. Whether this result generalises to the population as a whole is an unresolved question. The disincentive effect of a high replacement ratio would reduce the transition probability from unemployment to employment. Consistent with the hypothesis, the evidence presented in Section 4.1 shows that this transition probability is much lower for unskilled workers than for skilled workers.

4.2.4 Compressed wage distribution

In addition to the mechanisms outlined above, any tendency for the wages of less-skilled workers to be higher (relative to a competitively determined wage) than the wages of more-skilled workers, will tend to increase unskilled unemployment. Under such a scenario, low-productivity workers are relatively 'overpaid', and thus are relatively less attractive to employers.

For this explanation to be the most important one, any 'compression' of the wage distribution must affect not just very low-skilled workers, but also individuals higher up the wage distribution. Why? Because unemployment rates of semi-skilled workers are still substantially higher than unemployment rates of highly skilled workers.

Compression in the wage distribution could be due to institutional or non-institutional factors. In Australia, the award system is a potential institutional cause. Since the award structure affects workers across a wide range of skill levels, it could explain the cascading increases in average unemployment rates at progressively lower levels of skill. But it seems unlikely that such country-specific institutional factors are the main explanation, since Figure 1 shows that unskilled unemployment is comparatively high across a wide range of countries with very different institutional features.

Are there any underlying features of labour markets that could lead to a compression of the wage distribution, independent of institutional factors? Various academic theories of wage rigidity suggest possibilities along these lines. For example, Akerlof and Yellen (1990) develop an efficiency-wage explanation based on a 'fair-wage hypothesis'. They argue that a worker's effort will fall if they are paid a wage below that which they consider to be fair, and moreover that this fair wage will be affected by the wage paid to other workers in the firm or the economy more generally.[19] This dependence will increase the 'fair' wage for unskilled workers and decrease the 'fair' wage for skilled workers. An analytical model based on the fair wage assumption predicts that unskilled unemployment will be higher than skilled unemployment, and that the relationship between the two unemployment rates will be uncorrelated with changes in aggregate unemployment. These predictions provide a reasonable characterisation of the Australian evidence on unemployment presented in Section 3.

[19] One piece of evidence quoted by the authors consistent with this argument is that differences in wages between different firms and industries are highly correlated across workers of different skill levels.

5. Conclusions

This paper asks two questions. Firstly, what has happened to the market for skilled and unskilled labour in Australia as the aggregate unemployment rate has risen? Secondly, why is the unskilled unemployment rate substantially higher than the skilled unemployment rate, not just in Australia but also in virtually all OECD nations?

In response to the first question, demand for skilled labour has increased markedly in Australia in recent years. This is true whether skill is measured by educational attainment or by occupational skill level. However, wage relativities and unemployment relativities between skill groups have not changed substantially, because the supply of skilled labour has thus far kept pace with the shift in demand. There has been a large increase in the aggregate unemployment rate in Australia since the 1960s; however, this has not been disproportionately focused on the less skilled, and appears to be due to aggregate labour market factors.

In response to the second question, the high unemployment rate of less-skilled workers is associated with two factors: (i) a less-educated worker has a greater probability of exiting employment each period (a high 'separation rate'); and (ii) once not employed, a less-educated worker has a smaller probability of finding employment (a low 'matching rate'). The high separation rate for low-skilled workers is consistent with the explanation that less-skilled workers have less firm-specific human capital than skilled workers. However, this does not explain the low matching rate. Three explanations for this low matching rate are considered: that skilled workers are able to search for both skilled and unskilled jobs, that unskilled workers have higher replacement ratios than skilled workers, and that institutional factors or equity considerations have led to a compressed wage distribution. It is not clear which of these explanations is most important, although all three are consistent with various features of the Australian data.

A final comment. One approach sometimes advocated for reducing the natural unemployment rate is that aggregate wage restraint can be achieved by reducing wages at the lower end of the wage distribution – this in turn would place downward pressure on the distribution as a whole (Lowe 1998). The evidence presented in this paper suggests that *in the past*, wage pressures for less-skilled

workers have been in line with aggregate wage pressure. However, this does not necessarily suggest that future attempts to reduce unemployment should disregard solutions focusing on the wages for one group or another. Whether such ‘relative wage restraint’ soutions are the most appropriate way of reducing aggregate unemployment is a question left for future research.

Appendix A: Data

Data for Figure 1:

Australia: Males and females, 15–64 years of age. Source: ABS Cat. No. 6227.0 and ABS Cat. No. 6235.0.

United States: Males and females 25–64 years of age. Due to a change in the method of reporting educational attainment, data from 1992 onwards are not directly comparable with previous years. Source: *USA Economic Statistics* (1996).

Italy: Males and females 14–70 years. Skilled: with upper secondary qualification (diploma di scuola media superiore) including vocational qualification. Unskilled: without secondary school qualification. Source: *Annuario Statistico Italiano* (quoted in Jackman *et al* (1997)).

France: Selection criteria: males and females, 15 years old and over. Skilled: with baccalaureat general or vocational qualification (CAP or BEP). Unskilled: without either of the above qualifications. Source*: La Population Active d'Apres l'Enquete Emploi*, INSEE (quoted in Jackman *et al* (1997)).

United Kingdom: Selection criteria: males, 1664 years old; females, 1660 years old. Skilled: with A-level (or equivalent), including senior vocational qualification. Unskilled: with O-level (or equivalent), including junior vocational qualification. Source: General Household Survey individual record files (quoted in Jackman *et al* (1997)).

Canada: Males and females, 15 years and older. Skilled: with some post-secondary education. Unskilled: up to 1983: with 13 years of schooling (some or completed secondary education); from 1984 onwards: with secondary education qualification. Source: *The Labour Force, Statistics, Canada* (quoted in Jackman *et al* (1997)).

Data on labour force status by educational attainment are taken from *Transition from Education to Work*, ABS Cat. No. 6227.0 and *Labour Force Status and*

Educational Attainment, ABS Cat. No. 6235.0. Relevant labour force statistics from ABS Cat. No. 6227.0 are available on an annual basis from May 1989 to May 1998. There is a major structural break in this survey between 1992 and 1993 reflecting the introduction of a new classification of educational qualifications. Statistics from ABS Cat. No. 6235.0 are available annually from February 1979 to February 1994. The new classification of qualifications was introduced between 1993 and 1994, thus data for the last year of this survey are not comparable with previous years.

Data on labour force status by occupation are taken from Labour Force Status by Occupation of Last Job in *Labour Force, Australia*, ABS Cat. No. 6203.0. Data are available from 1966. After 1977 the definition of 'last job' was changed to 'last full-time job within two years', substantially reducing the proportion of the working age population represented by the survey results. There are structural breaks in this survey in 1986 and 1996, reflecting changes in the definition of occupation groups.

Data on transition probabilities are taken from the Survey of Employment and Unemployment Patterns (SEUP), using data on the Population Reference Group over the period September 1994 to September 1996. The SEUP is a longitudinal survey conducted by the ABS that was established between April and July 1995, and includes people who were aged 15 to 59 at that time and who were living in private dwellings in both urban and rural areas.

Definition of educational skill:

Skilled: Degree or non-degree tertiary qualification.

Unskilled: No post-school qualifications.

'Degree' means completion of a higher degree, postgraduate diploma or bachelors degree. 'Other tertiary qualifications' includes undergraduate diplomas, associate diplomas, skilled vocational qualifications and basic vocational qualifications. Persons still at school, and those that never attended school, are excluded.

Definition of occupational skill:

Before 1986 – Skilled: ‘professional, technical and related workers’, and ‘administrative, executive and managerial workers’; Unskilled: All other occupation groups, except ‘tradepersons, production workers and labourers, miners and quarrymen’. This group was excluded, since it contained a substantial proportion of both high-skilled and low-skilled workers.

Between 1986 and 1996 – Skilled: ‘managers and administrators’, ‘professionals’, ‘para-professionals’, ‘tradespersons’; Unskilled: All other occupation groups.

After 1996 – Skilled: ‘managers and administrators’, ‘professionals’, ‘associate professionals’, ‘tradespersons and related workers’, ‘advanced clerical and service workers’; Unskilled: All other occupation groups.

Appendix B: Steady-state Differences in Unemployment Rates

Our notation for a labour market transition is two lower case letters in italics (e.g. *ne* is a transition from not in the labour force to employment). For a labour market state we use a capital letter (e.g. *U* is unemployment). Since in equilibrium the flows into and out of each labour market state are equal, we can write:

$U \times ue + U \times un = E \times eu + N \times nu$ (flows from unemployment = flows into unemployment)

$E \times en + E \times en = U \times ue + N \times ne$ (flows from employment = flows into employment)

This also defines equilibrium for 'not in the labour force', since there are only three labour market states. To find the equilibrium unemployment rate as a function of the transition probabilities we solve the above inequalities simultaneously for the unemployment rate. This gives:

$$ur = \frac{(nu/ne)(en + eu) + eu}{ue(1 + nu/ne) + (nu/ne)(en + eu) + eu + un} \qquad \text{(B1)}$$

where *ur* is the unemployment rate.

A different but equivalent expression to this is given in Foster and Gregory (1982). They also calculate an expression for a four state system which includes part-time employment.

Table B1: Unemployment Rates by Educational Attainment
Actual and equilibrium rates, per cent

	Actual rate (SEUP)	Equilibrium rate (SEUP)	Per cent higher than degree-educated rate	Actual rate (ABS Cat. No. 6227.0)
Bachelors degree or higher	3.3%	2.7%		3.9%
Other tertiary qualification	5.5%	5.5%	2.8%	6.3%
Completed high school	10.6%	9.8%	7.1%	10.3%
Did not complete high school	13.8%	12.3%	9.6%	11.8%

Table B1 shows the actual unemployment rates from SEUP from September 1994 to September 1996, the calculated equilibrium unemployment rates, and the actual unemployment rates from ABS Cat. No. 6227.0. The unemployment rates from SEUP are similar to those from the Transition from Education to Work survey, although there are some differences, reflecting the following factors.

1. The Transition from Education to Work survey is conducted annually in May, whereas the SEUP results are based on unemployment rates over the entire calendar year. Thus, there are some timing and seasonal differences between the two sets of results.

2. Results in the two surveys are obviously affected by sampling error. This is particularly true for the SEUP survey, which is based on a small sample of only 2 300 respondents.

3. There was a moderate non-response rate in the SEUP survey to the question 'What is your highest level of educational attainment?'.

4. The SEUP survey is based on a sample of 15–59 year olds, compared with the Transition from Education to Work survey, which is based on 15–64 year olds.

Table B2 shows more detailed results for the contributions of various transition probabilities to the differences in unemployment rates between education groups.

Table B2: Contributions of Transition Probabilities

	Other tertiary	Completed high school	Not completed high school
Steady state difference from degree unemployment rate	2.8%	7.1%	9.6%
Marginal effect of each transition probability:			
Unemployment to employment (*ue*)	1.7%	3.1%	5.0%
Employment to unemployment (*eu*)	0.5%	3.2%	5.1%
Unemployment to not in labour force (*un*)	0.8%	1.3%	2.1%
Not in labour force to unemployment (*nu*)	–0.8%	–0.7%	–2.0%
Employment to not in labour force (*en*)	0.4%	1.6%	1.2%
Not in labour force to employment (*ne*)	0.9%	1.1%	2.2%
Contribution of pairs of transition probabilities:			
Employment and unemployment	2.0%	5.4%	8.1%
Employment and not in labour force	–0.1%	0.6%	–0.3%
Unemployment and not in labour force	1.2%	2.2%	2.7%

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