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THE EFFECT OF CHANGES IN THE AGGREGATE EMPLOYMENT RATE ON THE COMPOSITION OF EMPLOYMENT: AN AUSTRALIAN CASE STUDY (2002-2006)

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Abstract

A pronounced and extended rise in the employment rate might be associated with a change in the distribution of employment across the population. Here, we explore which personal characteristics are associated with employment and how, if at all, these relationships may have changed over time. Using unit-record data from the HILDA survey in 2002 and 2006, we estimate a binomial logit model to establish the relationship between employment and personal and household characteristics. The same relationship is then estimated for 2002 and 2006 data to establish if this relationship has changed in light of the significant increase in employment over this period. Although there was not a statistically significant change in the relationship, the point estimates suggest a broadening of employment over this period; the relative employment prospects of people with "low employment" characteristics in 2002 had improved by 2006.

To explore whether a change in participation or unemployment prospects had contributed to this result, we then separate individuals outside of employment into the unemployed, marginally attached and not in the labour force (NILF) and estimate a multinomial logit model. We find that unemployment was associated with different characteristics to those associated with NILF, while the marginally attached shared characteristics with both groups. Between 2002 and 2006, we find that the concentration of "low employment" characteristics in the unemployment pool was broadly unchanged. However, for both NILF and marginal attachment, the concentration of "low employment" characteristics decreased, suggesting that increased supply by these groups contributed substantially to employment growth.

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1.   Introduction

Australia's labour market strengthened significantly over the past decade and a half, assisted by structural reforms to industry and labour markets, as well as strong cyclical demand associated with the economic expansion. By 2003, the employment rate and participation rate were above the levels attained prior to the early-1990s recession, and in 2008 both were at multi-decade highs (Figure 1).

Figure 1: Labour Force Rates
Percentage of Population aged 15 years and above
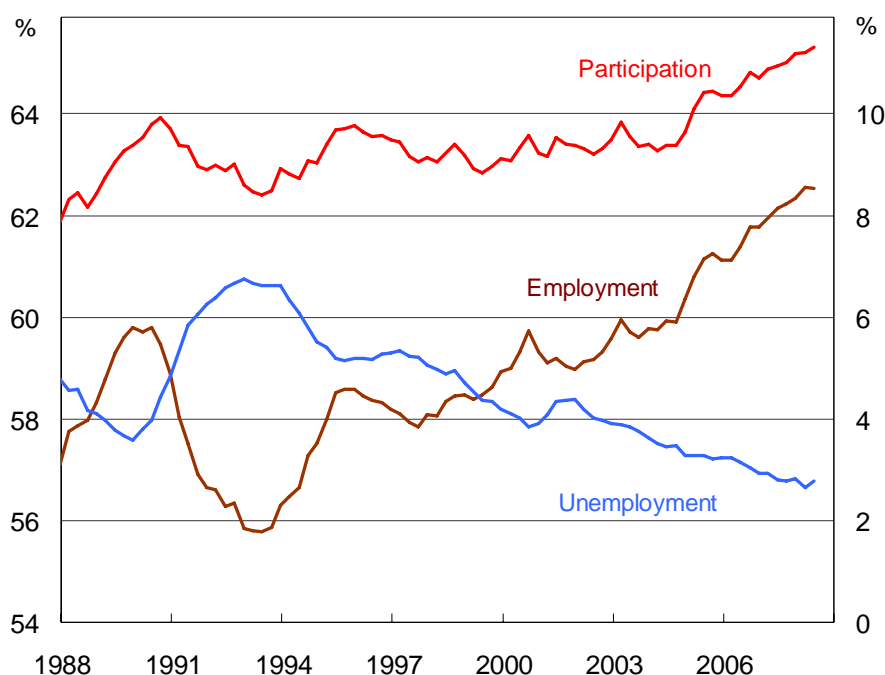
Sources: Labour Force Survey, ABS Catalogue No. 6203.0

The strong increase in the employment rate over this period appears to have been accompanied by a change in the composition of employment and non-employment. Official data from the ABS show that the relative employment rates of groups with

traditionally low attachment to the labour force, such as those aged 50 to 65, rose significantly, and there was a large fall in the number of long-term unemployed.[1] In addition, the NAB Business Survey recorded that the number of business reporting a lack of suitable labour increased to 72 per cent in March quarter 2008, compared to an average of 43 per cent over the previous 15 years, suggesting that the pool of skilled workers available to take up vacancies had been depleted.

Understanding these distributional changes is important for a number of reasons. From a macroeconomic perspective, these changes can have implications for the availability of suitable labour over and above aggregate measures such as the unemployment rate. One view of the labour market is that the personal characteristics that make someone 'employable' are relatively fixed. In this case, an increase in the employment rate will be limited by the proportion of people in the population with such characteristics. However, this view does not allow for changes in the level of experience and skill in the population. Nor does it allow for a change in either the mix of jobs offered by employers or the willingness of different groups to take up employment.

With these ideas in mind, we examine how the composition of employment and non-employment has changed in recent years. Is it the case that specific groups or types of people became more suitable for work or willing to take up employment? And, extending this question, was it a change in the composition of the unemployed or non-participating pools that contributed most to the change in the composition of employment?

To investigate these questions, we rely on data obtained through the Survey of Household Income and Labour Dynamics in Australia (the HILDA Survey), a longitudinal survey of individuals conducted between 2001 and 2006. These data allows us to undertake a detailed study of how personal characteristics are distributed across the employed and not employed. Because key data are available for only the years 2002 and 2006, we focus on these years, providing a case study

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[1] The fall over the 1990s in long-term unemployment has coincided with a rise in recipients of the disability support pension (DSP). However, the reductions in the pool of long-term unemployed since 2002 have occurred across all age groups, including in younger age groups who account for only a small proportion of DSP recipients (ABS Catalogue No 6291.0.55.001).

for how the distribution of personal characteristics across the employed and not employed has changed over this period. Although our sample period would ideally be longer, the rise in the participation rate of 1½ per cent combined with a fall in the unemployment to population ratio of 1 per cent over the period provides us with enough variation to make the analysis worthwhile.[2]

In Section 2, we review the literature, focusing on the relationship between personal characteristics and the likelihood that a person is in employment, as well as how this relationship may be expected to change as the aggregate employment rate increases. In Section 3, we introduce the data and provide graphical evidence that employment rates become more evenly distributed across different characteristics from 2002 to 2006. In Section 4, we use a formal statistical framework to test for a change in the distribution and present these results. We then extend this analysis in Section 5, to ask whether the change in the composition of the not employed is driven more by a change in the composition of the unemployed or non-participating pool. We conclude in Section 6.

2.   A Look at the Literature

2.1   What Characteristics are Associated with High or Low Employment Rates?

Empirical cross-sectional studies for Australia focus on explaining how personal characteristics are related to the probability of being in a particular labour force state; for example, unemployment duration (Carroll 2006), marginal attachment (Gray, Heath and Hunter 2002) or labour force participation (Belkar, Cockerell and Edwards 2007). Borland (2000) and Le and Miller (2000) provide a good review of the earlier Australian studies. The strength of the relationship between the probability of employment and personal characteristics varies somewhat depending on whether the researcher is interested in the unemployment or participation decision. However, a robust finding across studies is that factors likely to influence an individual's productivity, such as education, occupation and age, are positively related to the probability of employment, while factors that constrain supply, such

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[2] Labour Force Survey ABS Catalogue No. 6203.0; change from September quarter 2002 to September quarter 2006.

as having young children or alternative income sources, are associated with a low probability of employment. From this work, several key findings regarding characteristics emerge:

- Age. The young have less experience and are more likely to be studying, reducing the demand for, and supply of, their labour. Conversely, low wealth and search conditions attached to unemployment benefits provide an incentive to supply labour. Older workers are more likely to be able to draw down on their own wealth or have access to public pensions and hence are less likely to supply labour. Older workers' skill sets may also be less suitable in a labour market that has undergone rapid structural change.

- Parental status. Children are costly, and so increase the financial incentive to work. However, some women and sole parents may have a personal preference or financial incentive (due to the cost of childcare) to act as carers and reduce their labour supply.

- Education raises earning potential and so increases the financial incentives to work. Obtaining an education may also indicate that a person intends to supply labour or has a high natural ability for work. A higher level of education may also increase demand for the individual's labour.

- Occupation. Higher skills associated with certain occupations increase the incentive to supply labour, by increasing earning potential, and the demand for that individual's labour. Occupation may also be a marker of experience.

- Household finances. A higher level of non-labour household income may reduce the financial incentive to work of the individual. However, high household income may indicate a high level of human capital in the household, a strong attachment to the workforce and a better chance of matching with an employer. A higher level of household wealth may similarly affect labour supply and employment, but is also positively correlated with age and, thus, the effect of age on employability.

- Health and disability. Individuals with a disability or with poor health may be less able or willing to supply labour (in part reflecting access to pensions), or experience weak labour demand.[3]

- Migrant Status may affect employability if it is correlated with English ability, if migrants are subject to discrimination or if there is imperfect transference of human capital.

- Parent's attitudes and financial situation may influence an individual's education, work attitudes and behaviour in later life.

- Location. When the demand for labour varies across regions and inter-regional migration adjusts slowly to changes in labour demand, an individual's location will influence their employment prospects (Lawson and Dwyer 2002).

- Finally, an individual's own preferences for leisure and non-market work are likely to influence their labour supply.

2.2   Do these Relationships Change as the Employment Rate Rises?

The cross-sectional studies show a clear relationship between employment probability and personal characteristics. However, they do not shed light on how this relationship may have changed as the employment rate has risen. Should we expect to find a proportionate increase in the employment rates of different types of people between 2002 and 2006? Or has employment growth been associated with a broadening in employment across all types of people?

The theoretical and empirical literature suggest that a cyclical increase in the employment rate will disproportionately benefit those groups with low productivity or a low propensity to supply market labour — that is, those groups with relatively low employment rates (for example see Okun 1973; Blank 2000; Bils, Chang and Kim 2007).[4] This is because of the cyclical nature of employment for low-

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[3] More recent papers include Oguloglu 2007 and Wilkins 2004.

[4] Nickell and Bell (1996) attempt to theoretically quantify this effect. In an upswing characterised by a skill neutral increase in labour demand, they conclude that the

productivity or low-supply individuals; they experience the largest falls in employment during a downturn and so experience the largest rebounds in employment as the economy expands. There are several reasons touted as to why both the demand and supply of low-skilled workers may fall disproportionately during a downturn before reversing in during an expansion:

- In a downturn, employers may choose to hoard labour with the most firm-specific human capital, who we can reasonably assume are the most highly skilled.

- A flat unemployment benefit creates a higher relative replacement ratio for low-productivity (and hence low-wage) workers (Borland 2000, p.12), reducing their incentive to participate if expected wage growth slows;

- High-productivity workers have an incentive to remain employed, owing to their comparative advantage in market work, and may accept a lower-paid match following separation in a down-turn. If employers always seek the highest skilled applicant to fill a position, this would crowd out low-productivity workers during an economic slowdown (Okun 1973; Blank 2000).[5] Concurrently, workers with a comparative advantage in non-market work may slow entry rates and speed exit rates when wage growth slows in a downturn (Bils, Chang and Kim 2007); and

- If wage growth slows, the minimum wage rate may become binding for low-productivity workers, encouraging employers to lay-off such workers.

These hypotheses are supported by empirical studies, which generally find that employment becomes more broadly distributed in periods of high employment

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unemployment rates of unskilled and skilled workers should decrease equiproportionately, so that the percentage point change in the low-skilled unemployment (or employment) rate is greater than that in the high-skilled unemployment (or employment) rate.

[5] During the recent upswing, ABS data suggest that job-to-job churn and the rate of voluntary separation both increased. This behaviour is consistent with the idea that higher-skilled or more productive workers take low-productivity jobs when employment rates are low, and then 'trade-up' as new high-productivity jobs are opened and employment is expanding, thereby creating vacancies for those with lower skills to fill

growth. The main body of empirical studies use time-series data and focus on the relative cyclicality of unemployment rates by skill level, industry, average wage or education. Borland (2000) presents data for Australia that shows that employment rates increases by more for low-skilled cohorts (proxied by age, education and occupation) when the aggregate employment rate rises. Using a long panel dataset from the UK, Bils, Chang and Kim (2007) split the sample into low-, mid- and high-productivity workers and regress each group's unemployment rate against the aggregate unemployment rate over time. They also find low-productivity workers have much more cyclical unemployment rates.[6]

Of course, over the recent episode of falling unemployment, structural or long-term influences are likely to have influenced the relative employment rates of different groups. First, there may have been a relative shift in labour demand over the cycle owing to changing industry composition or other factors.[7] Second, the deregulation of labour markets over recent decades may have increased flexibility in minimum employment conditions and wages, increasing the relative demand for lower-skilled labour. Finally, the demand for, and supply of, labour by different cohorts may have been influenced by demographic, income-tax and welfare eligibility changes. Therefore, while we may expect a broadening of employment between 2002 and 2006 for cyclical reasons, the combination of influences make it difficult to know *a priori* how the distribution of employment across different groups, and conversely how the distribution of personal characteristics across the employed and non-employed, may have changed over the period.

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[6] Gray, Heath and Hunter (2002) adopt a cross-sectional approach using data from the Australian Survey of Employment and Unemployment Patterns (1994-97). They estimate the effect of the local unemployment rate on the transition probability from unemployment to employment and marginal attachment to employment. They find only tentative signs that a higher unemployment rate has a different effect on men and women, who have different propensities to supply labour, but note that the small size of the affect may be because the survey occurred during a period of volatile employment growth.

[7] Nickell and Bell (1996) examine data for a range of countries, including Australia, and conclude that the relative unemployment rate of the unskilled generally *fell* while aggregate unemployment rates rose during the early 1990s recession. They suggest a change in relative labour demand favouring the less skilled caused this shift.

3. Data

Our analysis makes use of the HILDA Survey. Although it covers a relatively short time period, the HILDA Survey provides a wider range of information than that contained in the Labour Force Survey (LFS) or in the Household Expenditure Survey. In addition, the unit record data enables us to look at the distribution of employment across different characteristics controlling for other factors, such as the distribution of characteristics in the population. Although HILDA is the best available dataset for our analysis, there are drawbacks that need to be kept in mind when interpreting the results. For example, recent immigrants, who have made a large contribution to the recent increases in labour supply, are under-represented in the survey. The survey also contains limited time-series information on respondents' attitudes to work and leisure that are likely to influence labour supply.

Developments reported by the HILDA Survey are generally consistent with the LFS: the employment rate in HILDA increased from 62.0 per cent to 64.7 per cent between 2002 and 2006; and the proportion of the working age population in unemployment and outside the labour force fell. However, the employment rate is higher and the unemployment rate is lower in the HILDA survey than in the LFS.[8]

We focus upon the characteristics described in the literature as per Section 2; detailed descriptions of most of these variables are in Appendix A. Here we explain the construction of some variables that warrant a more detailed discussion.

The dependent variable in our analysis is the employment status of the individual in the week prior to the interview, which occurs each year around August and September. The definitions of employment, unemployment, marginal attachment and not in the labour force are identical to those used for the Labour Force Survey.

The three financial variables are household income less own-labour income, net household wealth and the debt-to-income ratio. Following Belkar, Cockerell and

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[8] Attrition is sufficiently high in HILDA to potentially bias results. Attrition rates are higher for the groups most likely to be unemployed, causing unemployment rates for these groups to fall over time. To counter this effect we use appropriate weights in our graphical analysis. In the econometric analysis we estimate the coefficients without weighting the data. The results are highly robust to using the replicate person weights.

Edwards (2007), household income less own-labour income is defined as all income earned by all members of the household (including pension income) less the wages of the individual in question. It measures the income a person can access without working, assuming that the household pools the income of all members.[9] Net wealth is calculated using information from the wealth modules in 2002 and 2006 and is defined as total household assets less total household debt. The debt-to-income ratio is total household debt from the wealth module divided by household income less own-labour income. Defined this way, this variable measures the ability of the household to service its debts if the individual in question does not work.

We include two different measures of labour market experience, a measure of recent labour market experience and a measure of life-time labour market experience.[10] Recent labour market experience is measured as the percentage of the previous financial year spent in employment. Measured this way, the current labour force status does not overlap with previous labour force status. Life-time labour market experience is measured as the percentage of time spent in employment since finishing full-time education.

Our sample consists of 17606 individuals: 8952 in 2002 and 8654 in 2006. We restrict this further by considering only individuals aged 18 to 65 years (losing 5227 observations), those who have a work history (losing 244 observations) and those with no missing information for other explanators (losing 2869 observations). Hence our results are conditional upon being of working age and having been previously employed.

3.1   A Graphical Representation of the Data

To gauge the bivariate relationship between each characteristic and employability we plot the employment rate across a range of the key characteristics identified in the literature for 2002 and 2006. From this we highlight two broad features. First, the distribution of employment rates across characteristic types is not uniform,

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[9] It also gives an imperfect indicator of the partner's employment status, which may also influence an individual's employment preferences (Le and Miller 2000; Breunig and Cobb-Clark 2007).

[10] Gregg (2001) shows that unemployment scarring can be long lasting.

providing clear evidence that certain characteristics are more strongly associated with employment than others (Figure 2). Prime aged workers are more likely to be employed than those aged over 55 years. Likewise, those with recent labour market experience, individuals with higher education and managers and professionals are more likely to be employed than other individuals. Coupled males with children and females without dependent children are similarly more likely to be employed than individuals with other 'family' characteristics.

The second feature, and our primary interest, is to examine whether the distribution of employment across different groups has changed between 2002 and 2006. For nearly all groups, we see that the probability of employment has increased, reflecting the higher aggregate employment rate in 2006 than in 2002. We see that across most characteristic groups, the relative probability of employment shows much the same pattern; for example, those with less-than-high-school education have lower employment rates in both 2002 and 2006. However, those characteristics associated with the lowest employment rates in 2002 were associated with the largest increases in employment between 2002 and 2006. In other words, there appears to have been a broadening of employment between 2002 and 2006, consistent with existing time series evidence regarding periods of economic expansion.

Figure 2: Employment Rates by Characteristic

Percentage of Each Sub-Group in Employment
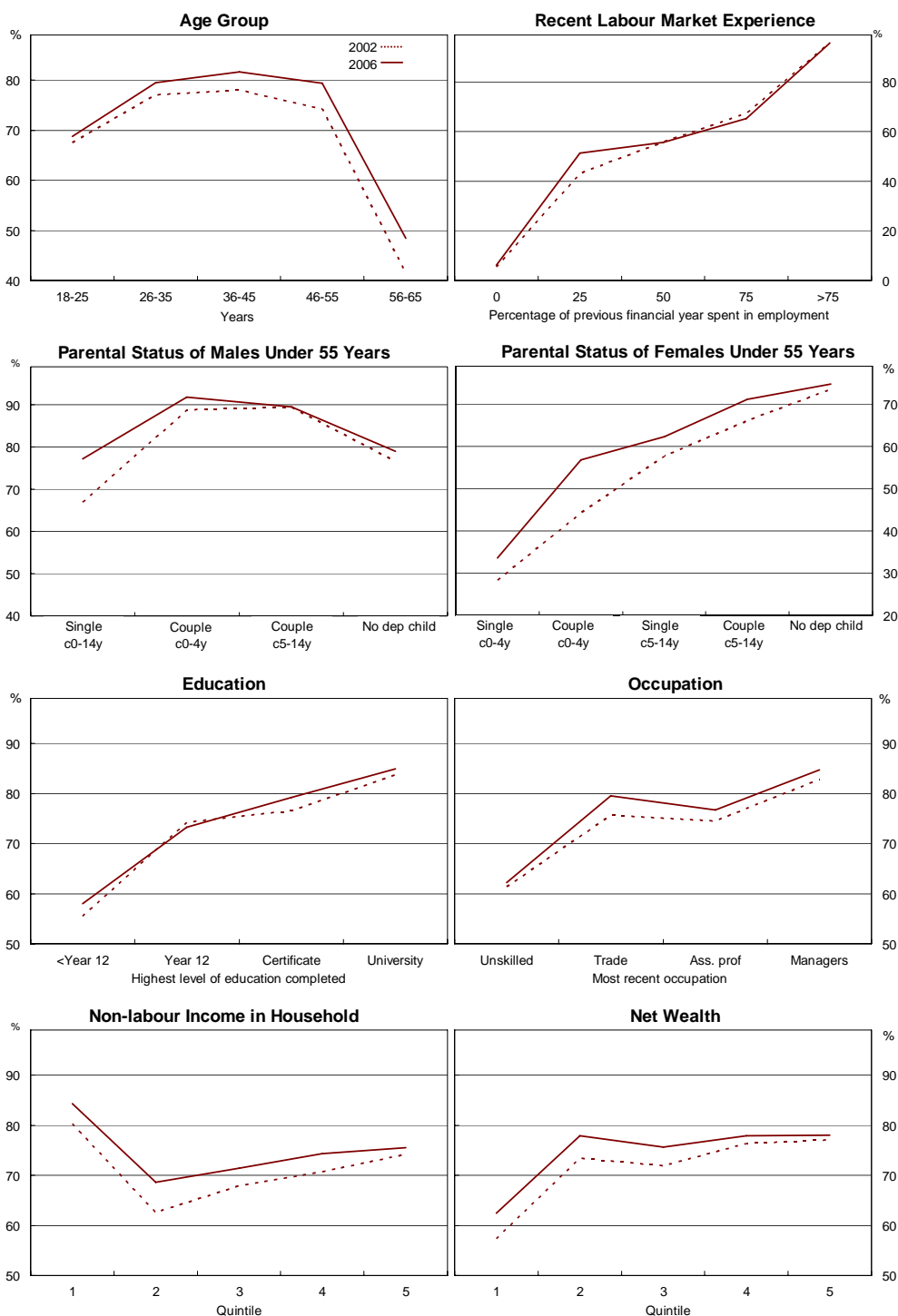
Notes: Sample includes people aged between 18 and 65 years; data are weighted; non-labour income in household refers to all income earned by household members including pensions and excluding the labour income of the individual in question

Source: HILDA Wave 6.0

4.   Comparing the Employed to the Not-employed

4.1   Methodology

The graphical comparison shows that those groups with the lowest employment rates in 2002 experienced the largest increases in employment rates between 2002 and 2006. We can more reliably relate personal characteristics to employment by using a statistical model to quantify the probability of being in employment depending on a range of individual and household characteristics. The standard way to do this using unit-record data is to estimate a discrete choice model. We are interested in how those in employment differ from those outside employment (two mutually exclusive states), and so we specify a binary logit model in which individuals can be either employed or not employed. We can also look at whether the relationship is statistically different across 2002 and 2006, and determine which characteristics have been associated with the increase in employment.

We proceed in two steps. First, we estimate a binomial logit using pooled data for 2002 and 2006 in order to ascertain which characteristics are associated with high and low probabilities of employment. The binomial logit model defines the probability of an individual being in employment as a function of his or her characteristics:

$$P(Y = E | X) = \frac{e^{X\beta^E}}{1 + e^{X\beta^E}} \tag{1}$$

where $Y=E$ indicates employment (the alternative is non-employment), X is a vector of dummy variables (x_j) indicating personal characteristics and β^Y is a vector of coefficients.[11]

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[11] We estimate our model using the logit and mlogit commands in Stata 10. We have not applied weights; the qualitative story is robust to including or excluding weights. The HILDA sample is fairly representative of the population across the variables we include and attrition between Waves 2 and 5 does not appear to be a problem, most likely because the sample was replenished in Wave 5.

We present our results in terms of the odds ratio (*OR*) of employment associated with each characteristic (x_i). The odds measures the probability of the person being in employment relative to the probability of the person not being in employment conditional on the person's characteristics. The odds ratio associated with each characteristic is the ratio of two odds: the odds that an individual who has the characteristic in question but otherwise exhibits the "base" set of characteristics is in employment; and the odds that an individual who exhibits the full "base" set of characteristics is in employment. Mathematically:

$$OR^{x_i} = \frac{P\left(Y = E \middle| x_i = 1, x_{j \neq i} = 0\right) \middle/ \left[1 - P\left(Y = E \middle| x_i = 1, x_{j \neq i} = 0\right)\right]}{P\left(Y = E \middle| x_i = 0, x_{j \neq i} = 0\right) \middle/ \left[1 - P\left(Y = E \middle| x_i = 0, x_{j \neq i} = 0\right)\right]} = e^{\beta_{x_i}^E} \qquad (2)$$

An odds ratio greater than one indicates that the odds of being in employment are higher for a person who exhibits that characteristic than for a person who is otherwise identical but does not exhibit that characteristic. In this way, we can identify which characteristics are associated with a higher probability of being in employment.

In the second step we ask how the relationship has changed over time. We estimate the same model for 2002 and 2006, and compare the size of the odds ratios to see if an intuitive story emerges. If the odds ratio associated with a certain characteristic has increased, it suggests that that characteristic became more closely associated with employment between 2002 and 2006. We can formally test for differences by estimating a single binomial logit model and interacting a 2006 dummy with all the explanatory variables; if this interactive term is statistically significant we conclude that the relationship between that characteristic and employability has changed over time.

We include two variables capturing individuals' labour market history in the model.[12] Current labour market experience can shape an individual's future labour market experience, a process known as state dependence or scarring. Scarring is thought to occur because a stint outside employment can cause the individual to lose job-related skills or develop attitudes against working (Arulampalam, Gregg

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[12] This places our model in the class of inertia models; see Le and Miller (2000).

and Gregory 2000).[13] Previous outcomes may also imply something about an individual's unobserved productivity level and her propensity to supply labour. Including explanators that capture past employment activity, therefore, controls for the unobserved heterogeneity across individuals, increasing the efficiency of the estimation and reducing the potential bias in the estimates of the coefficients on other variables.[14]

Certain variables were excluded from the preferred regression. We exclude all industry variables as these were generally insignificant and data were missing for a further 1223 people. Variables measuring the education and occupational status of regions were excluded; state and territory variables and remoteness variables appear sufficient to control for regional influences. Unfortunately, data on work attitudes were only available for 2001. Given that attitudes may have changed over time, we chose to exclude this explanator. If included in the pooled regression, attitudes had the expected positive relationship with employment status, but were insignificant at the 10 per cent level.[15]

Continuous variables such as wealth and non-own-labour income appear to have a non-linear relationship with employment status (see Figure 2 above). To avoid specifying the functional form of the non-linear relationship, we convert all continuous variables into categorical dummies. The same general story emerges from the data if the model is specified using continuous variables and polynomial terms are included to account for non-linear relationships.

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[13] Gregg (2001) provides empirical support for this idea using data for the UK. See Le and Miller (2001) and Knights, Harris and Loundes (2002) for empirical studies of state dependence in Australia.

[14] An alternative approach is to exploit the panel aspect of the HILDA data using a fixed effects model. The main advantage of the fixed effects model is that it controls for the effect of unobserved characteristics, potentially reducing omitted variable bias. However, the fixed effects model cannot include any time-invariant explanators, such as education or sex, and the coefficient estimates may be biased if a lagged dependent variable is included. Further, selectivity bias introduced by non-random attrition and measurement-error in the explanators is exacerbated. We prefer the inertia model, which provides some control for unobserved characteristics and allows us to include time-invariant explanators.

[15] The exact variable was an index measuring how strongly the individual agreed with the statement "It is important to have a job to be happy".

4.2   Results from the Pooled Cross Section

The regression results from the pooled 2002 and 2006 data confirm the relationships between personal characteristics and employment identified in Section 3. Our model is able to predict 93.1 per cent of the observations and has a pseudo R-squared of 0.67. We report the results graphically in Figure 3; an odds ratio greater than one indicates that the characteristic is associated with a high probability of being in employment and vice versa for an odds ratio less than one. As expected, characteristics typically associated with high supply or high productivity raise the probability of being in employment. In particular, the probability of being in employment is high for younger workers, coupled males, females without children, individuals with more work experience, and those with a high level of education and a higher occupation status. In contrast, the probability of being employed is lower for those aged over 45 years, women with young children, those with less than high school education, production and unskilled workers, migrants from non-English speaking backgrounds and people with very little work experience. A few results are worth discussing in more detail.

One of the key predictors of employment status is work history. Excluding these variables, we correctly predict only 81.8 per cent of observations and the pseudo R-squared falls to 0.30. As expected, past employment experience has a positive relationship with current employment – the greater the proportion of the previous financial year (or lifetime) spent in work, the greater the likelihood that that individual is employed (Figure 3).

Financial incentives are also strongly related to the probability of being employed. Theory suggests that a higher level of alternative household income may decrease the financial incentive to work. Consistent with this we find a negative relationship between the probability of being employed and alternative household income (Figure 3). Similarly, the positive relationship between the debt-to-income ratio and the probability of being in employment indicates a strong financial incentives effect.[16]

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[16] Belkar Cockerell and Edwards (2006) attempt to identify a causal effect of increased debt-to-income ratios on the labour supply of women.

Unexpectedly, we observe a positive relationship between wealth and the probability of being employed. This pattern is not consistent with the idea that those with higher wealth may substitute toward leisure from employment. Instead it is possible that wealth is positively related to unobserved human capital, which should be positively linked to the probability of being employed.

Finally, the occupation of an individual's father is significantly related to the probability of being in employment; the children of managers are less likely to be in employment than those of trade or production workers. This pattern may reflect the possibility that the children of managers spend more time in education, or have a greater preference for leisure owing to higher wealth levels, although these factors should be captured by the wealth and education variables.

Figure 3: Odds Ratios of Employment Versus Non-Employment
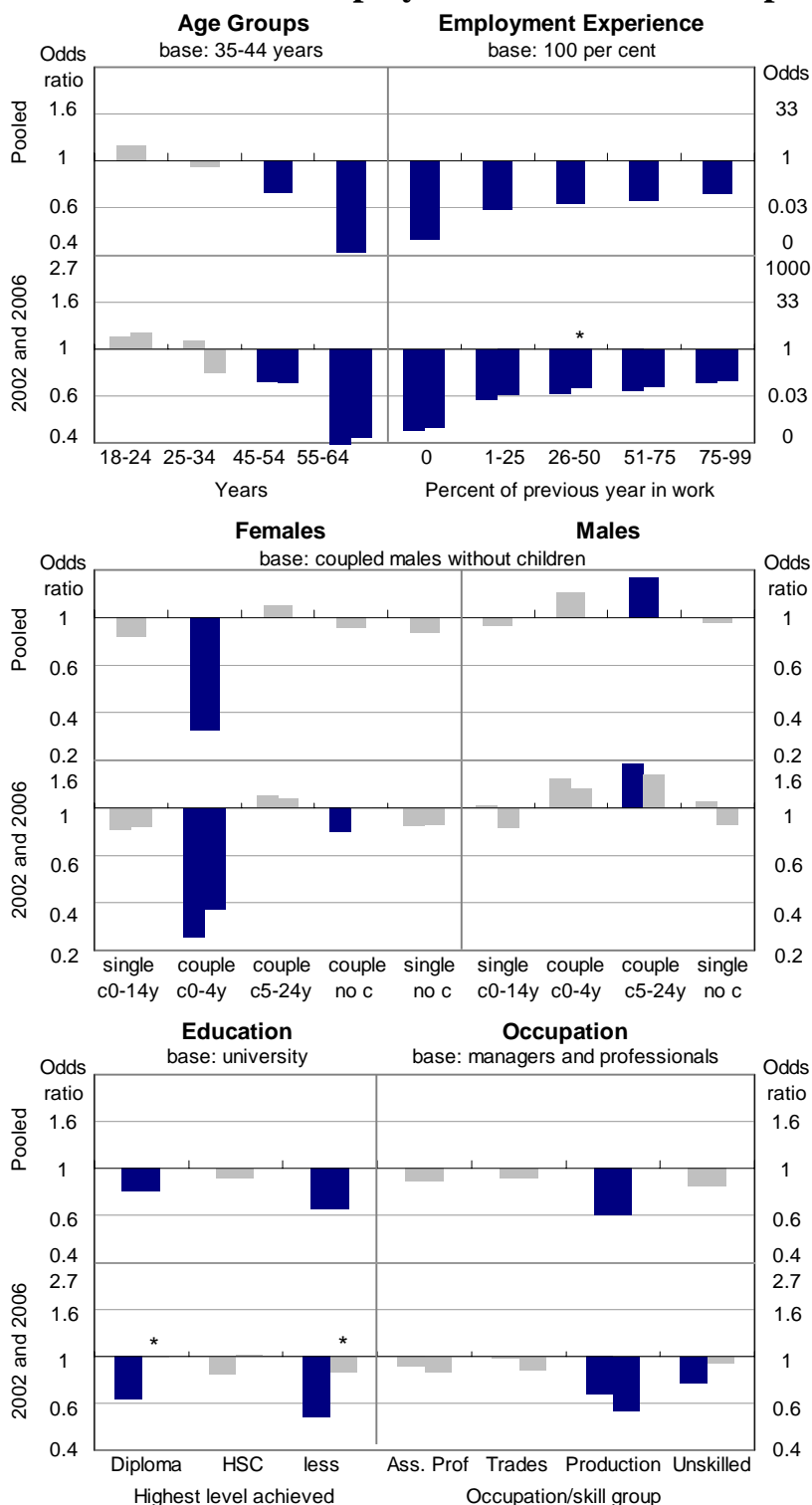
Notes: Logarithmic scale; blue bars indicate significance at the 10 per cent level; a star indicates that the 2002 coefficient is significantly different to the 2006 coefficient at the 10 per cent level

Source: HILDA Wave 6.0; RBA

Migrant Status
base: Australian born

Income Quintiles
base: top quintile

Net Wealth
base: top quintile

Debt-to-Income
base: ratio over 3

Father's occupation
base: managers and professionals

Miscellaneous
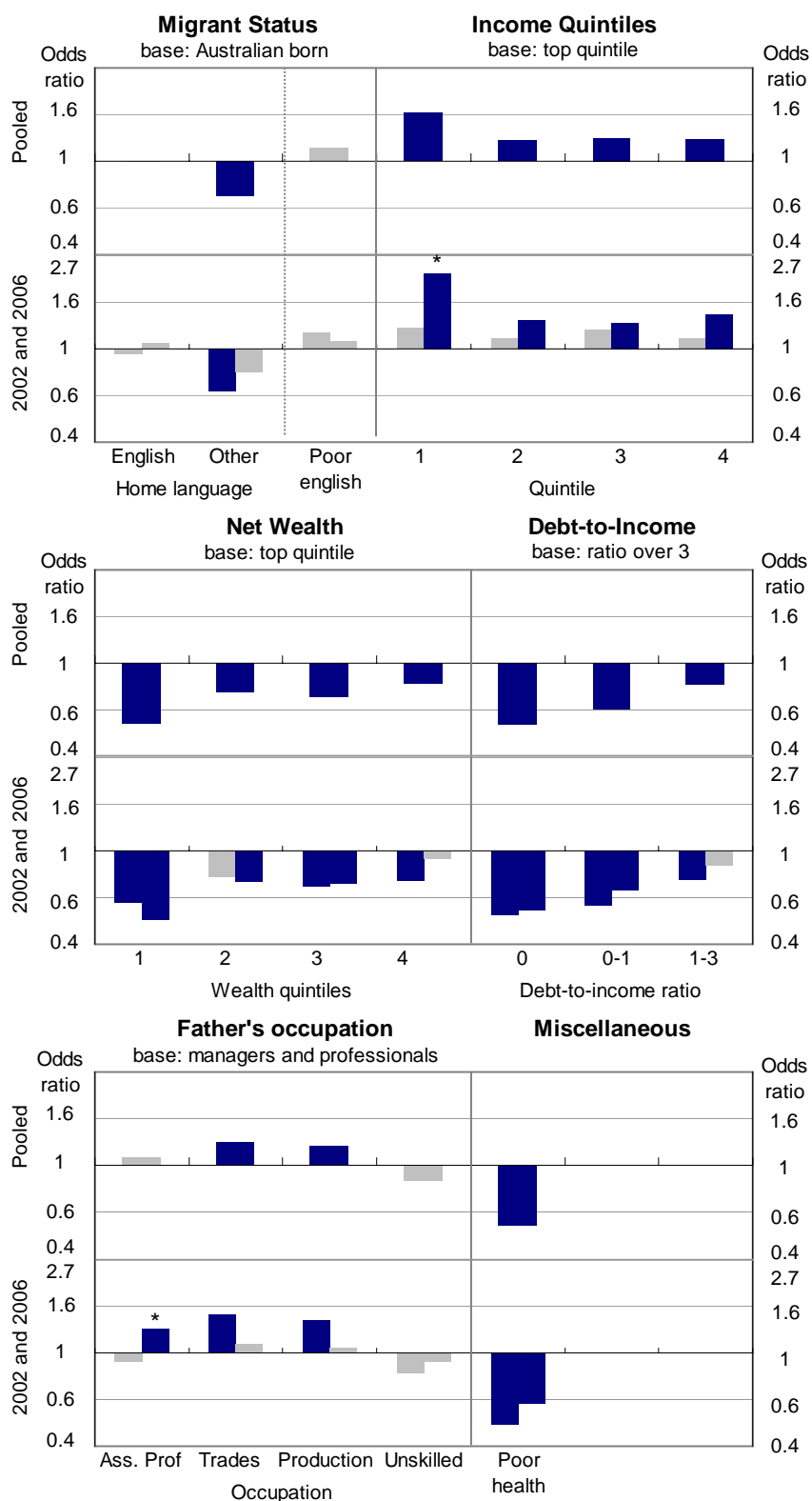
Notes: Logarithmic scale; blue bars indicate significance at the 10 per cent level; a star indicates that the 2002 coefficient is significantly different to the 2006 coefficient at the 10 per cent level

Source: HILDA Wave 6.0; RBA

4.3 Comparing 2002 and 2006 — the Change Over Time

Having identified the characteristics associated with employment, we next answer whether the non-employed have become more or less similar to the employed, and which characteristics are central to understanding that change. When we include a full set of 2006 interaction dummies in the pooled regression we find that the fit of the model is unchanged, the pseudo R-squared is 0.67, and we are able to correctly predict 93.2 per cent of observations. Very few interactive terms are found to be significant at the 10 per cent level (indicated in Figure 3 by a star atop the odds ratio), and a Wald test that all interactive terms are equal to zero cannot be rejected at the 10 per cent level. We test the significance for each group of characteristic dummies using separate Wald tests — only two categories (father's occupation and regional location) are significant at the 10 per cent level. Thus, the change in the distribution over time appears to be minimal.

Nevertheless, we find that the point estimates do change in an economically interpretable way (bottom panels of Figure 3). Further, this change is consistent with that seen in Figure 2. The characteristics least associated with employment in 2002 were relatively more likely to be in employment in 2006. In other words, there had been a broadening of employment across the groups with the lowest employment rates in 2002.

Notably, the estimated odds ratios across all categories of employment experience (where the base case is 100 per cent employment in the previous year) are higher in 2006 than in 2002. Less employment in financial year 2005/06 will still raise the probability that an individual will be outside employment when surveyed in late 2006, but the odds ratio has fallen since 2002. The effects of this phenomenon can be seen directly in the fall in the proportion of the sample who are long-term unemployed (over 24 weeks) from 1.0 per cent to 0.6 per cent. This result supports the idea that during an employment expansion the average level of recent work experience in the population rises. It also suggests that the strength of the relationship between 'employability' and the unobserved individual characteristics has weakened between 2002 and 2006.

Additionally, the change in the odds ratios for certain age and family groups suggests a rise in labour supply for demographic groups with relatively low

participation rates. The odds ratios across the age groups have risen for those aged 55 to 65 years and for women with young children. These results are consistent with the documented delay in retirement and increased use of childcare (ABS Catalogue Nos. 4402.0 & 6208.0). It is likely that policy and attitudinal changes have influenced these decisions, as a four year period is probably too short for cohort effects to be important.

Other low employment groups also appear to have benefited in a relative sense from increased labour demand. The relative probability of employment of the unskilled, those with lower education and migrants from non-English speaking countries are all higher in 2006 than in 2002. In the case of education, the increases in the odds ratios of employment associated with less-than-high-school and diploma-level education are significant at the 10 per cent level (noted by a star in Figure 3).

One dimension in which the low-employment groups have not been found to benefit is across the net wealth categories; the odds ratios of employment for the two bottom net wealth quintiles have fallen. However, it is difficult to interpret this change because of the endogeneity of wealth to employment. A related concern is that although we observe a broadening in employment across observable characteristics, it is possible that there has been a narrowing in employment across unobservable characteristics (unrelated to employment experience).

5. Breaking Not-Employed into Unemployment, Marginal Attachment and NILF — the Multinomial Logit Model

5.1 Methodology

In the binomial logit model we treat all people not employed as similar. However, 'not employed' consists of three separate groups with potentially quite different characteristics: the unemployed, the marginally attached and those not in the labour force (NILF). The results from the binomial logit are likely to reflect the difference between those in employment and those in the NILF group, who outnumber the other not-employed three to one. Because much of the contribution to employment growth between 2002 and 2006 has come from a fall in the rates of

marginal attachment and unemployment, we are particularly interested in the characteristics associated with these groups and whether these have changed over time.

We treat the marginally attached (individuals wanting work but either unavailable in the reference week or with no search activity) as being separate to the NILF group (those not available and not searching) for several reasons: the average characteristics exhibited by the marginally attached can differ significantly from those not in the labour force (see Figure 2); their transition rates into employment and unemployment are higher than for the NILF group (Gray, Heath and Hunter 2002); and they form a group twice as large as the unemployed pool.

Again, we proceed in two steps. We first assess which characteristics are associated with each of the non-employed states by estimating a multinomial logit model. For each alternative labour force state, the multinomial logit estimates the probability that a person with a given set of characteristics is a member of that state. For example, for unemployment this is:

$$P\left(Y = U \big| X\right) = \frac{e^{X\beta^U}}{1 + e^{X\beta^U} + e^{X\beta^{MA}} + e^{X\beta^{NILF}}} \tag{3}$$

where X is a vector of dummy variables indicating personal characteristics and β^Y is the vector of coefficients associated with state Y and $e^{X\beta^E}$ is normalised to equal unity. We can calculate the relative probability of being in the alternative state rather than in employment for a given X vector, which we will call the relative risk. For unemployment this is:

$$\frac{P\left(Y = U \big| X\right)}{P\left(Y = E \big| X\right)} = e^{X\beta^U} \tag{4}$$

Using this information we can then calculate a relative risk ratio (*RRR*) of unemployment for characteristic x_i, which is the relative risk of being in unemployment for a person who exhibits that particular characteristic but in all

other ways has the base characteristics, compared to the relative risk of being in unemployment for a person who has the full set of base characteristics:

$$RRR^{x_i^U} = \frac{P\left(Y=U|x_i=1, x_{j\neq i}=0\right)/P\left(Y=E|x_i=1, x_{j\neq i}=0\right)}{P\left(Y=U|x_j=0\right)/P\left(Y=E|x_j=0\right)}$$

$$= \frac{e^{\beta_1^U x_1+...+\beta_i^U .1+...+\beta_k^U x_k}}{e^{\beta_1^U x_1+...+\beta_i^U .0+...+\beta_k^U x_k}} = e^{\beta_{x_i}^U} \tag{5}$$

Since we use employment as the base case, the RRR of unemployment tells us how each characteristic increases the probability of being in unemployment rather than in employment. For example, if the relative risk ratio associated with low education in the unemployment regression is 2 then an individual with low education is twice as likely to be unemployed than employed compared to someone with the base education characteristic a university degree. There is a separate RRR for each characteristic for each of the labour force states so that a characteristic may have a high RRR with respect to unemployment, but a low RRR with respect to NILF. Thus, the multinomial logit allows us to gather a significant amount of information about how each characteristic is related to labour force status.

5.2   Pooled Cross-Sectional Results

The multinomial logit has a lesser ability to predict employment status than the binomial logit. We correctly predict 87.6 per cent of observations, fewer than in the binomial logit.[17] The model also underpredicts the unemployment and marginal attachment rates and overpredicts the NILF rate.

Nevertheless, the regression results from the pooled 2002 and 2006 data confirm that the relationship between characteristics and labour force status is different for

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[17] The predicted labour force state is the state with the highest probability for each individual.

each of the non-employed groups (Figure 4). The unemployed are the most like the employed — the RRR (with employment as the base case) is closest to one for most characteristics — while the NILF group is least similar to the employed group. Unemployment is generally associated with:

- Males, unskilled or production workers and those with diploma-level education, and is strongly and negatively related to net wealth and recent labour market experience.

In contrast, NILF is associated with:

- Older workers, women with young children, migrants from non-English speaking countries, high household income and low debt levels, trade and production workers and those with lower education. NILF appears unrelated to net wealth and has a non-monotonic relationship with recent employment experience.

Falling somewhere between the two is marginal attachment, which has features in common with both unemployment and NILF. In particular, marginal attachment is associated with:

- Older workers, females (especially women with young children), single parents, less-than-high-school education, migrants from non-English speaking countries, higher levels of household income and low debt-to-income ratios. Like unemployment, it is negatively related to net wealth. Like NILF, it has a non-linear relationship with work history.

It is worth discussing a few of the key differences in more detail.

An insignificant coefficient on youth in the unemployment regression is somewhat surprising given the relatively high rate of unemployment for this category. This result is partially due to the exclusion of those who have never worked from our sample, and partially to the inclusion of net wealth as a regressor. As was the case with the binomial logit, the pattern of coefficients on the net wealth variable across labour market states supports the view that net wealth may be proxy for human capital. The probability of being unemployed or marginally attached is negatively

related to net worth, yet no apparent relationship exists for NILF. If those with higher net wealth were choosing greater amounts of leisure, as theory implies, then we would expect a stronger relationship in the NILF regression. Further, excluding the age variables (often used to proxy for experience or human capital) from the regression alters the coefficient estimates on the wealth variables, suggesting that the two variables are highly correlated (results not shown).

Figure 4 further shows that labour force status is highly correlated with parental status and education. Women with young children have a particularly high probability of being NILF or marginally attached, while men with children (including non-resident children) are significantly less likely to be NILF, consistent with traditional divisions of labour within households.[18] Those with less than high school education are more likely to be NILF or marginally attached, consistent with the idea that the decision to increase education depends jointly on the willingness to be in the labour force.

Finally, three key groups appear prominent in the set of marginally attached individuals: those aged over 45 years; single parents; and women more generally. Their status suggests that for some reason these groups do not undertake much job search or may not be flexible enough to begin work immediately. Yet, these people state that they would like to work. Understanding the employability of these groups is likely to require a better knowledge of what influences job search activity and the transition from non-work to work.

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[18] The finding that women with no dependent children are more likely to be NILF may reflect the tendency for women to retire earlier than men.

Figure 4: Relative Risk Ratios From The Pooled 2002 and 2006 Data
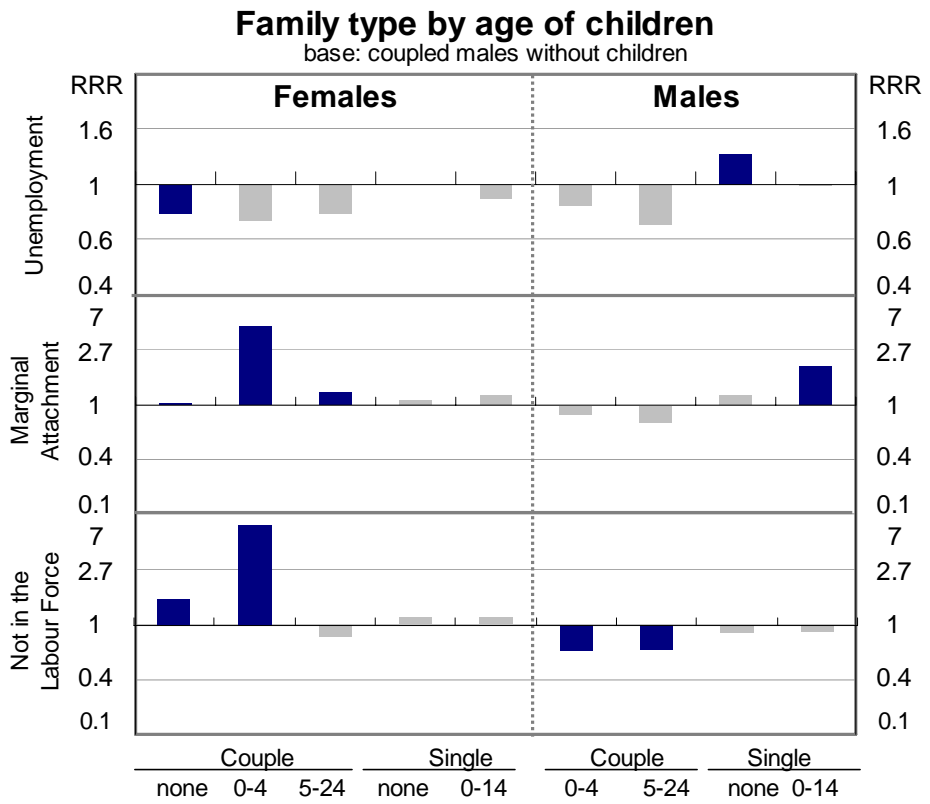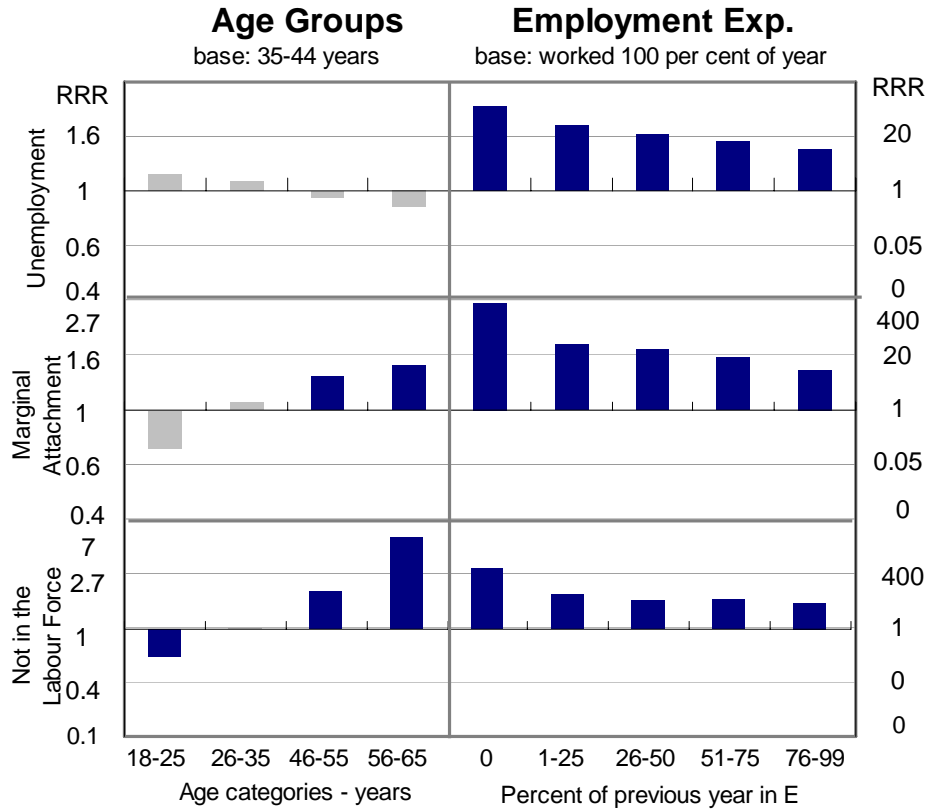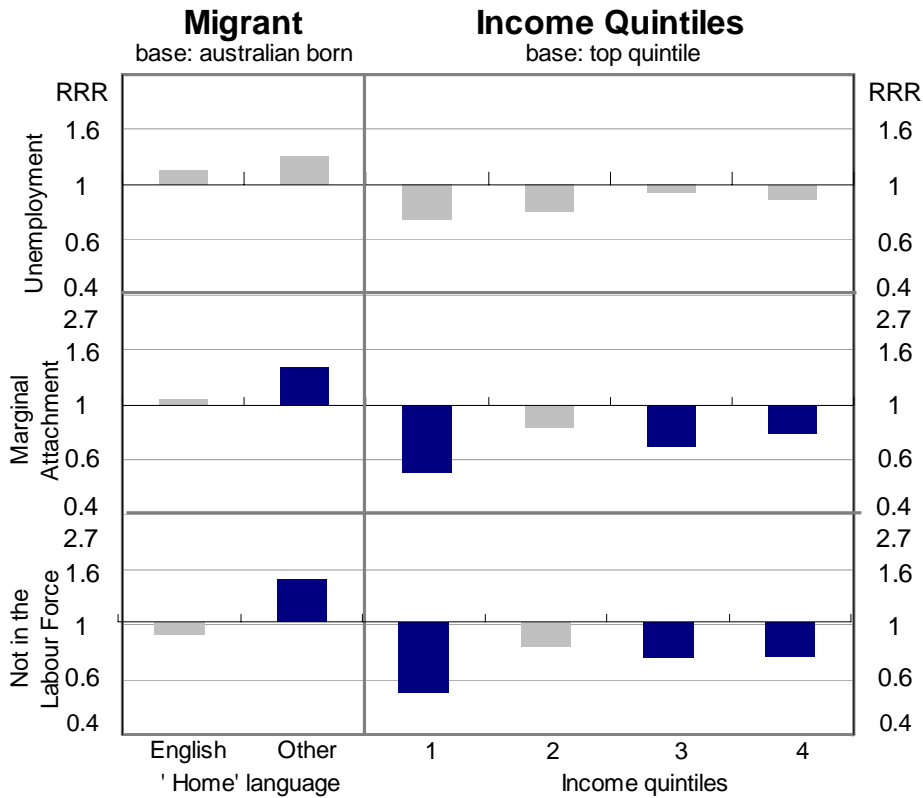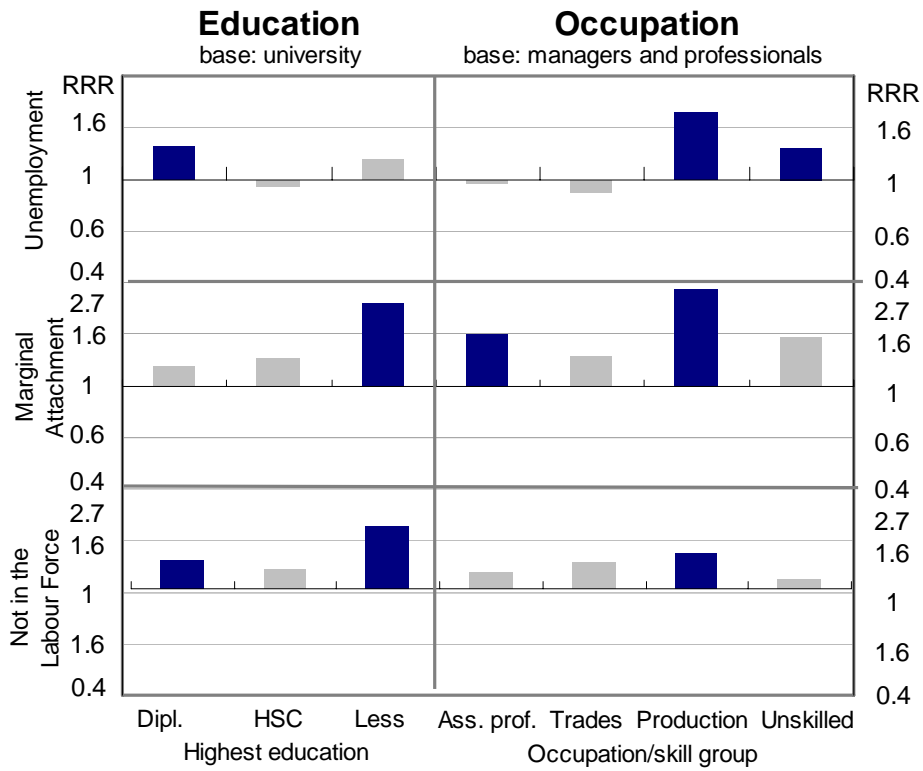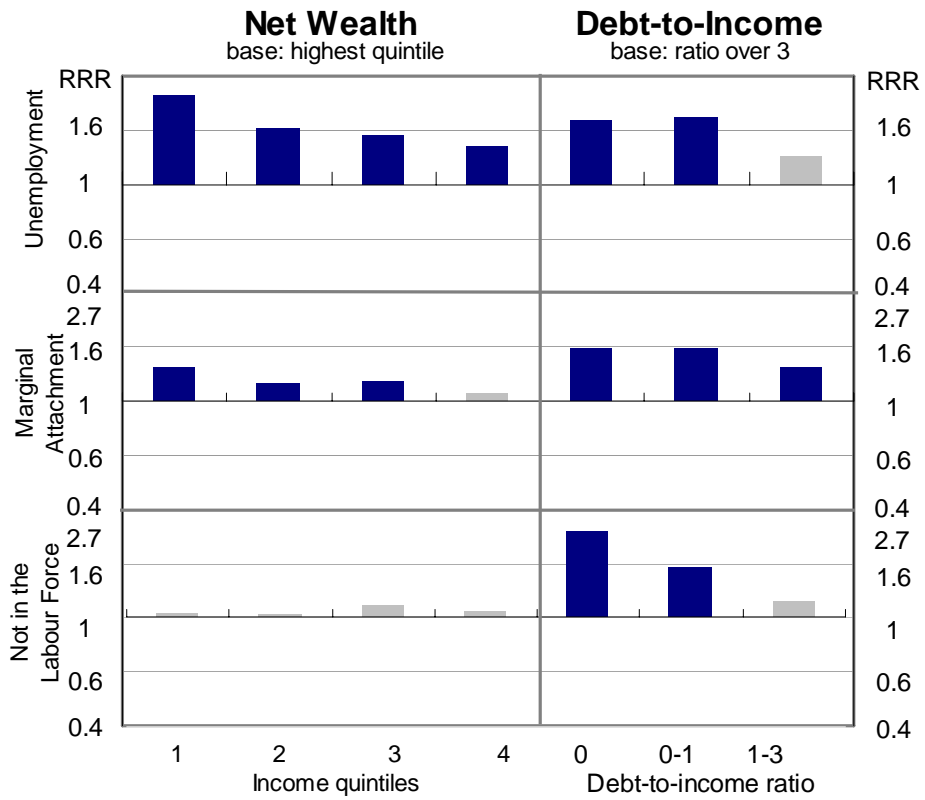
Education
base: university

Occupation
base: managers and professionals

Migrant
base: australian born

Income Quintiles
base: top quintile

Net Wealth
base: highest quintile

Debt-to-Income
base: ratio over 3

Notes: Logarithmic scale; blue bars indicate significance at the 10 per cent level; a star indicates that the 2002 coefficient is significantly different to the 2006 coefficient at the 10 per cent level

Sources: HILDA Wave 6.0; RBA

5.3   Comparing 2002 and 2006 — the Change Over Time

When we compare the relationship between personal characteristics and labour market status over time, we find that the change over time has been rather different across labour market states. We gain no better fit or predictive power by expanding the model to allow for the change over time. However, a Wald test of the significance of the full set of 2006 interactive dummies is significant for the NILF regression at the 10 per cent level (and significant for the marginal attachment regression at the 15 per cent level). Further, testing of groups of dummies shows that for both the marginal attachment and NILF regressions the 'employability' of several groups is statistically different in 2006 than in 2002 (see Appendix B, Table 5). These results have two key implications. First, much of the increase in employment rates over this period was generated by higher participation suggesting a significant role for changes in labour supply. Second, the pool of those who are unemployed does not appear to have become more concentrated in low-employability characteristics.

5.3.1 Marginal attachment and NILF

As with the binomial logit, the point estimates for 2002 and 2006, and the change in between, can be interpreted in an economically meaningful way; we find that the RRRs that have moderated the most are for those groups that originally had low participation and employment rates (Figure 5). In particular, we find that for both marginal attachment and NILF:

- The RRR of those aged over 45 years decreased, reflecting the increase in participation by these cohorts between 2002 and 2006;

- The RRR of less than 100 per cent employment in the previous year experience decreased, albeit marginally;

- The RRR of coupled mothers decreased, consistent with LFS data pointing to increasing use of childcare through this period; and

- The RRRs decreased for low income and poor health (not shown), as well as unskilled occupations and less-than-high-school education consistent with

theories that suggest an increase in demand for, and supply of, such workers during an upswing.

Delving further into the change in the HILDA participation rate, we find that the marginal attachment rate fell much more than the NILF rate over the period 2002 to 2006. This has significant implications for measuring labour supply. Currently, the marginally attached are contained within the NILF group in the standard LFS measure of labour force participation. However, as much of the extra employment has been due to a fall in marginal attachment, a broader (and potentially more relevant) measure of participation may include the marginally attached in the labour force. Using LFS data, this alternative definition of the labour force indicates a slower rate of growth in labour supply than the standard measure over recent years; the 'broad' participation rate of those aged 15-69 years rose by only 1.2 percentage points between 2002 and 2006, compared with a rise of 2.0 percentage points in the standard measure.

5.3.2 Unemployment

The relationship between personal characteristics and unemployment appears to have changed by less between 2002 and 2006 than for the other not employed categories; the sequential Wald tests are almost all insignificant and very few interactive dummies are individually significant. This may reflect the fact that the very small size of this group undermines the power of the estimation. But taken at face value, it does provide evidence to suggest that the unemployed pool has not become more concentrated with individuals with less-employable characteristics between 2002 and 2006.

As is the case for the other labour force states, the point estimates suggest that the groups with the lowest employment rates in 2002 became more employable by 2006. The RRRs for low levels of work experience, education and income all decreased, although the negative relationship with net wealth appeared to strengthen.

Figure 5: Relative Risk Ratios for Marginal Attachment: 2002 versus 2006
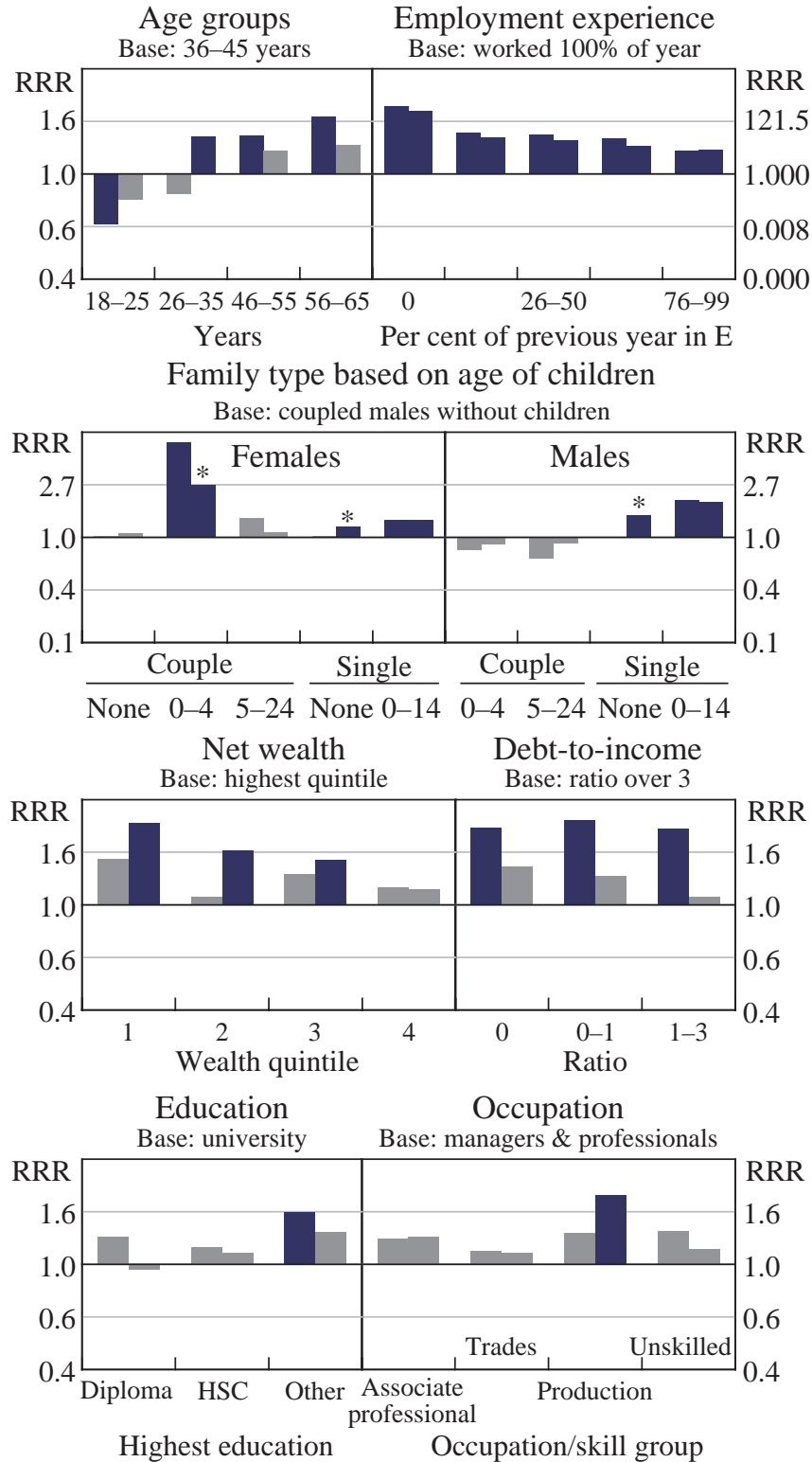
Notes: Logarithmic scale; blue bars indicate significance at the 10 per cent level; a star indicates that the 2002
         coefficient is significantly different to the 2006 coefficient at the 10 per cent level

Sources: HILDA Wave 6.0; RBA

Figure 6: Relative Risk Ratios for NILF: 2002 versus 2006

Notes: Logarithmic scale; blue bars indicate significance at the 10 per cent level; a star indicates that the 2002 coefficient is significantly different to the 2006 coefficient at the 10 per cent level

Sources: HILDA Wave 6.0; RBA

Figure 7: Relative Risk Ratios for Unemployment: 2002 versus 2006

Notes: Logarithmic scale; blue bars indicate significance at the 10 per cent level; none of the 2002 coefficients were significantly different to the 2006 coefficients at the 10 per cent level
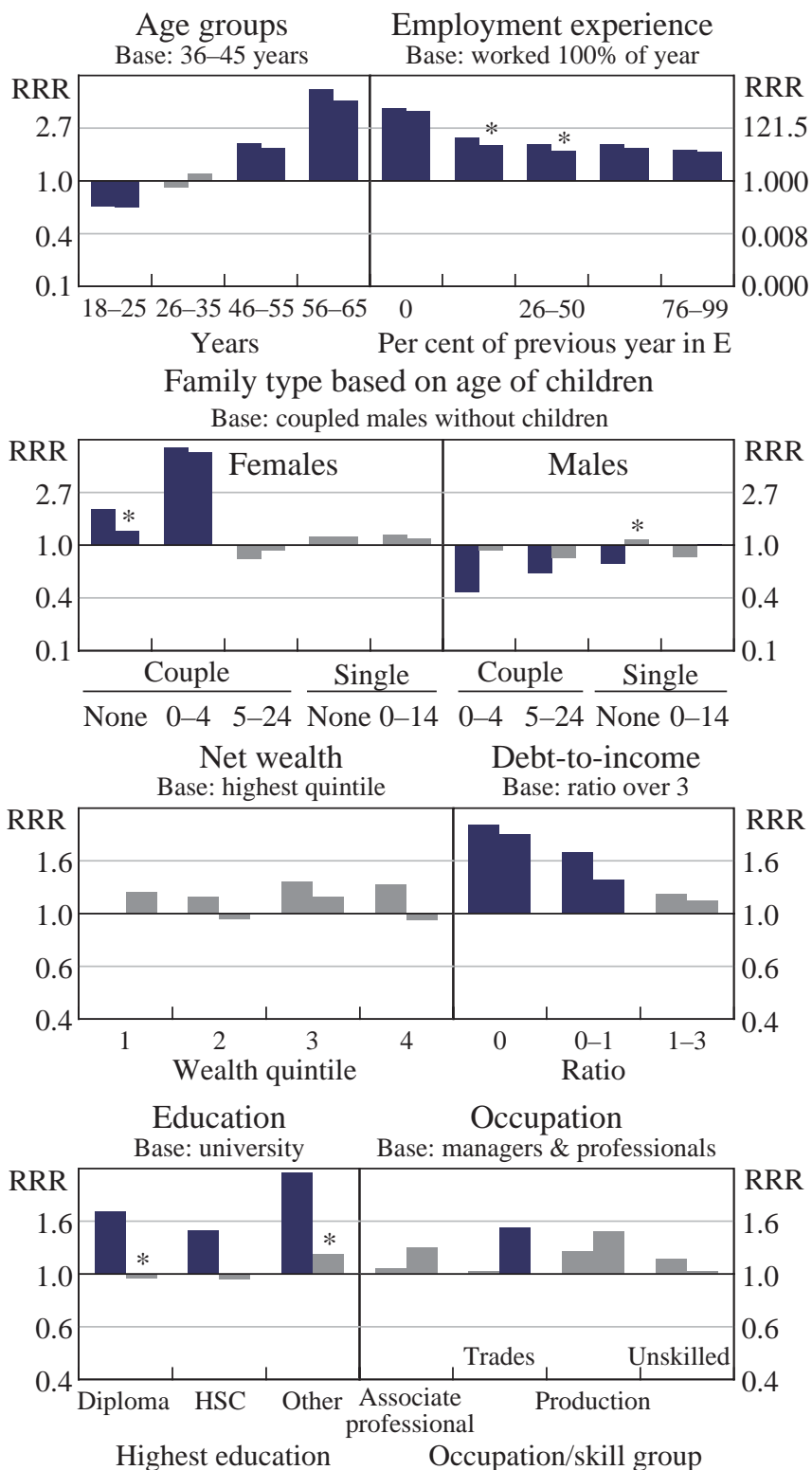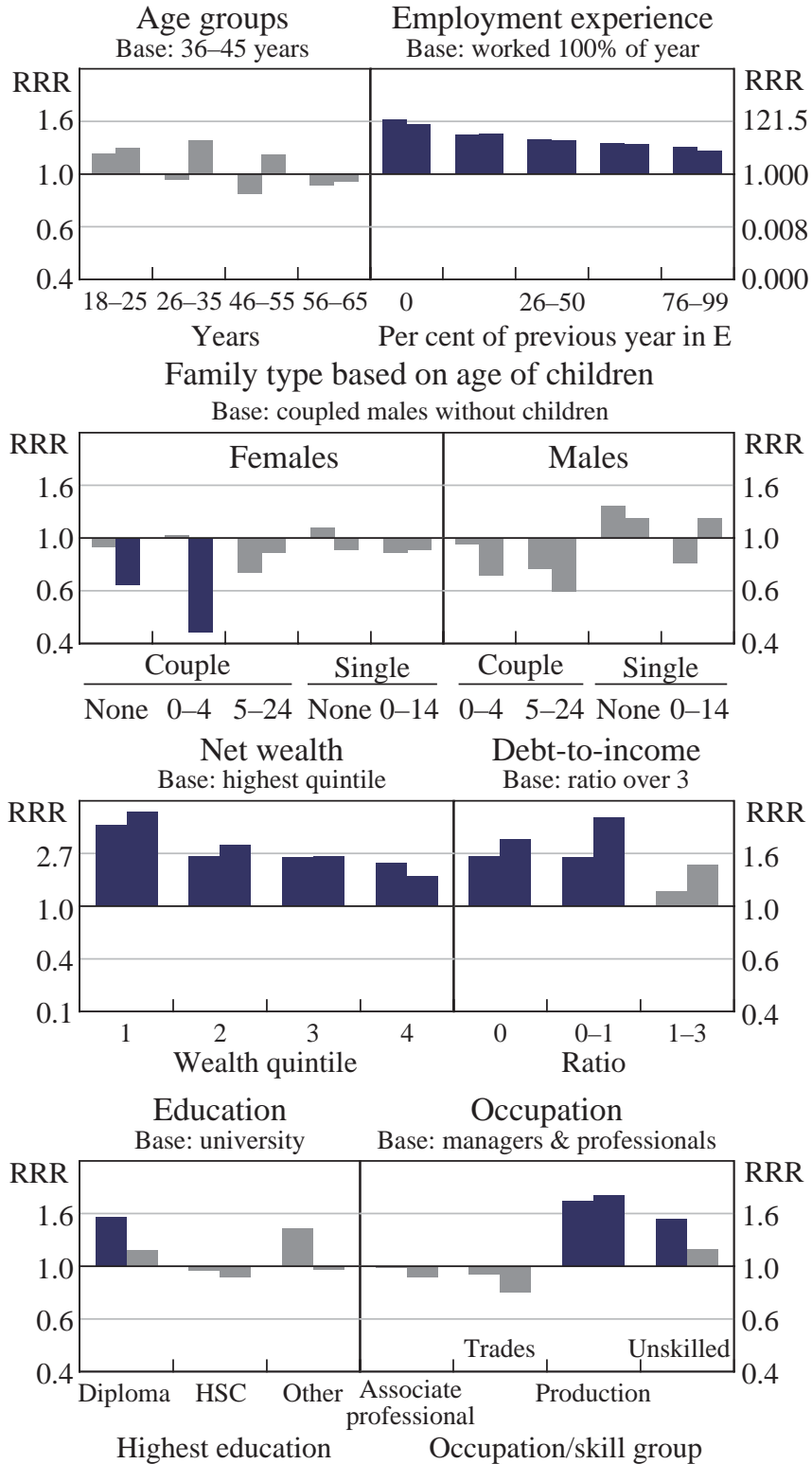
Sources: HILDA Wave 6.0; RBA

5.4   Comment

Our results indicate that lower-skilled workers and groups which have lower employment rates were disproportionately drawn into employment as employment expanded between 2002 and 2006. In general, this supports Okun's theory that during a period of expansion, workers in the labour market trade-up and vacancies are filled by less skilled workers. It also supports the notion that structural changes have occurred in the labour market to support participation by groups which typically have low participation rates such as mothers and older workers.

Another way to assess how employability has changed is to compare the concentration of characteristics in the not-employed pool for 2002 and 2006. If employability was associated with a static set of characteristics we may expect that as employment expanded, these 'low-employability' characteristics would become more concentrated in the not-employed pool. However, consistent with our initial results, we find that as the employment rates of those people with less 'employable' characteristics have risen, the concentration of these characteristics in the pool of people outside employment has generally fallen (see Appendix C; note that age is an exception).

Further, a notable rise has also occurred in the level of experience of people not employed; between 2002 and 2006, the share of the pool who had worked for over 75 per cent of the previous year rose (Figure 8). This reflects the fact that there is considerable churn in the labour market as individuals move between jobs and in and out of employment.[19] As the employment rate rose over this period, the duration of employment and the probability of finding employment also increased, raising the average level of recent work experience of the whole population. This suggests that at high levels of employment the average skill level of the economy is higher, somewhat mitigating against a shortage of suitable labour.

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[19] Monthly LFS data from 2000-2005 indicate that around 4 per cent of employees are not employed in the next month, while just over 20 per cent of the unemployed and 10 per cent of NILF are employed in the next month. In the annual HILDA sample, around 8 per cent of the employed are not employed when interviewed the following year, while around 50 per cent of the unemployed and 20 per cent of those not in the labour force were employed when interviewed in the following year (for the period 2001/02 to 2004/05) (Carroll and Poehl 2007).

Figure 8: Proportion Of Previous Year Spent In Work

Share Of The Pool Outside Employment
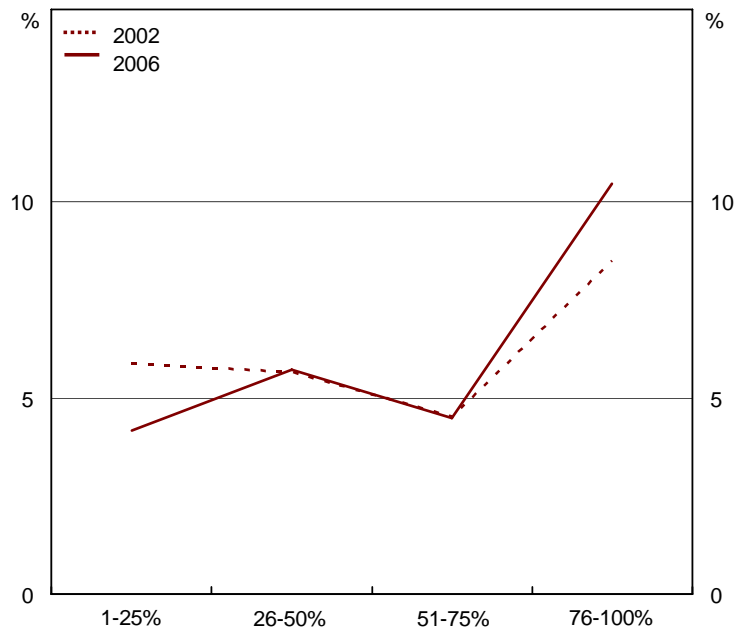
Notes: Share with 0 per cent work experience in previous year was 75.5 in 2002 and 75.2 in 2006 (not shown)

Source: HILDA Wave 6.0

6.   Conclusion

Since the early 1990s, Australia's labour market has experienced considerable structural change and a strong increase in the demand for labour. We explore whether the relationship between an individual's characteristics that are likely to influence employability and labour force status changed as employment expanded.

The results from the binomial logit model, drawing on pooled HILDA data from 2002 and 2006, suggest that the probability of being employed during this period was highest for younger workers, coupled males, females without children, individuals with more work experience, and those with a high level of education and a higher occupation status. Although our results suggest that there was not a statistically significant change in the relationship between characteristics and employment between 2002 and 2006, the point estimates suggest that the types of people who were most likely to be outside employment in 2002 faced improved relative employment prospects in 2006. In addition, there was an increase in the

average level of recent labour market experience amongst the pool of people outside of employment in 2006.

A drawback of the binomial framework is that it groups together individuals – the unemployed, the marginally attached and those not in the labour force – who are likely to have quite different personal characteristics. When we separate individuals not employed into these three groups we find important differences. Results from our multinomial logit model using the pooled data from 2002 and 2006, suggests that unemployment was positively associated with being male and unskilled and negatively associated with net wealth and recent labour market experience. In contrast, NILF was associated with older workers, women with young children, migrants from non-English speaking countries, high household income and low debt levels and those with lower education. The marginally attached have features in common with both the unemployed and NILF.

When we repeat our analysis of the change over time for the multinomial logit, we find that the concentration of observable characteristics in the unemployment pool associated with low employment rates was largely unchanged over this period – the unemployed in 2006 look much as they did in 2002. However, for both NILF and marginal attachment, the concentration of observable characteristics associated with low employment rates decreased – particularly for those individuals aged 45 years and over, coupled mothers and those with less-than-high-school education.

Although our analysis covers only the short period between 2002 and 2006, the results underline the idea that in a strong labour market – employment and employment experience became more broadly distributed throughout the population. In particular, we find that those groups with traditionally low labour supply increased their labour force participation over this period.

Appendix A: Variable Definitions

Table 1: Information Regarding the Variables Used

Dependent Variable

Labour Force Status	Definitions used are the same as for the Labour Force Survey 6201.0. Measured at time of survey.

Explanatory Variables

For each category listed below there are several potential characteristics. In the regressions we include a dummy variable for each possibility, which will take the value of 1 if the individual exhibits that characteristic and zero otherwise. For list of variables see Tables 2 and 4A-C.

Household income (excluding individual labour income) quintile	Annual gross household income excluding the individual's labour income but including the partner's (and other family members') labour income as in Belkar, Cockerell and Edwards (2007). It is also used as the denominator in the debt-to-income ratio.
Occupation	Based on one-digit ASCO classifications. Associate professionals includes associate professionals, intermediate services workers and clerical workers. Unskilled includes elementary clerical, unskilled clerical and unskilled labour. The occupation of not-employed individuals is that of their most recent job.
Father's occupation	Uses the same classification as for the individual's occupation. Refers to the occupation of the father when the individual was 14 years of age.
Family type based on age of child	Classifies all individuals into a family type first based on whether they are in a couple or single and then by the age of their own youngest resident child (in years). A separate variable is also included to capture non-resident children under the age of 18 years.
City variables	Capital cities; major cities; and rural. Major cities includes all major cities and inner regional areas based on ARIA scores from the 2001 Census. Rural is outside of capital or major cities.
Net worth	Household assets less household debt.
Health condition	Individual identifies a long term health condition, disability or impairment.
Migrant status	An individual is either born in Australia; born in a non-English speaking country; or born in an English speaking country.
Mother's employment status	Refers to a mother's employment status when the individual was 14 years of age. The mother were either employed or not employed.
Student status	Three categories are included: full-time student; finished studies within the previous two years; and other. This last category is referred to in Tables 2 and 4A-C as "not-student" but may include part-time students.
Time in work in previous year	Measures the proportion of the previous financial year that the individual spent in employment. This measure does not overlap in time with current employment status.

Appendix B: Results Tables

Table 2: Binomial Logit *(continued next page)*
Odds ratio of employment relative to non-employment relative to base case[1]

	Pooled	2002	2006	Diff.[2]	Pooled ex. History[3]
2006 year dummy (v 2002)	1.0				1.2***
Age (v 36-45 years)					
18-25 years	1.2	1.1	1.2		1.6***
26-35 years	0.9	1.1	0.8		1.1
46-55 years	0.7***	0.7**	0.7**		0.7***
56-65 years	0.4***	0.4***	0.4***		0.2***
Birth country (v Aust)					
English speaking	1.0	0.9	1.1		1.0
Non-English speaking	0.7***	0.7***	0.8		0.5***
Education (v university)					
Diploma or certificate	0.8**	0.6***	1.0	**	0.7***
High School	0.9	0.8	1.0		0.7***
Less than school	0.6***	0.5***	0.8	**	0.5***
Occupation (v professional)					
Associate professional	0.9	0.9	0.8		0.8***
Trade	0.9	1.0	0.9		0.7***
Production	0.6***	0.7*	0.6***		0.5***
Unskilled	0.8	0.8*	0.9		0.5***
Father's occupation (v professional)					
Associate professional	1.1	0.9	1.3*	*	1.1
Trade	1.3**	1.5***	1.1		1.2**
Production	1.2**	1.4**	1.0		1.2***
Unskilled	0.8	0.8	0.9		0.9
Mother not employed (v employed)	1.1	1.2	1.0		1.1***
Student status (v not student)					
Enrolled full-time	0.9	1.0	0.8		0.5***
Finished studies 1-2 years ago	1.4**	1.6	1.3		0.9

Table 2: Binomial Logit *(continued)*

Odds ratio of employment relative to non-employment relative to base case[1]

	Pooled	2002	2006	Diff.[2]	Pooled ex. History[3]
Time in work in previous year (v 100%)					
0 per cent	0.0***	0.0***	0.0***		n.a.
1-25 per cent	0.0***	0.0***	0.0***		n.a.
26-50 per cent	0.0***	0.0***	0.1***	*	n.a.
51-75 per cent	0.1***	0.0***	0.1***		n.a.
76-99 per cent	0.1***	0.1***	0.1***		n.a.
Time in work since school (v over 50%)	0.8**	0.9	0.7**		n.a.
Health condition (v healthy)	0.5***	0.5***	0.6***		0.3***
Housing tenure (v mortgagee)					
Outright owner	0.9	0.9	0.9		0.8***
Renter	1.3*	1.1	1.4*		1.6***
Family status (v male couple with no child)					
Female	0.9	0.8*	1.0		0.7***
Single with no child	1.0	1.1	0.8		0.7***
Couple, male, child 0-4 years	1.3	1.4	1.2		1.3**
Couple, male, child 5-24 years	1.5***	1.6**	1.4		1.9***
Couple, female, child 5-24 years	1.1	1.1	1.1		0.8***
Couple, female, child 0-4 years	0.3***	0.3***	0.3***		0.1***
Single, child 0-14 years	0.9	1.0	0.8		0.4***
Has non-resident child	1.4**	1.5*	1.4		0.9
Net wealth (v top quintile)					
1st quintile	0.5***	0.6**	0.5***		0.2***
2nd quintile	0.7**	0.8	0.7*		0.4***
3rd quintile	0.7***	0.7**	0.7**		0.6***
4th quintile	0.8*	0.7*	0.9		0.8**
Income less own labour income (v top quintile)					
1st quintile	1.7***	1.2	2.2***	**	2.9***
2nd quintile	1.2*	1.1	1.4*		1.4***
3rd quintile	1.3**	1.2	1.3*		1.3***
4th quintile	1.3**	1.1	1.4**		1.4***

Table 2: Binomial Logit *(continued)*

Odds ratio of employment relative to non-employment relative to base case[1]

	Pooled	2002	2006	Diff.[2]	Pooled ex. History[3]
Debt-to-income ratio (v above 3)					
0	0.5***	0.5***	0.5***		0.2***
0-1	0.6***	0.6***	0.7***		0.4***
1-3	0.8**	0.7*	0.9		0.6***
Remoteness (v capital city)					
Major city	1.1	1.1	1.1		1.0
Rural	1.0	1.1	0.9		1.0
State or Territory (v NSW)					
Victoria	0.9	1.0	0.9		1.1
Queensland	0.9	0.9	0.9		0.9
South Australia	1.1	0.9	1.1		1.1
Western Australia	1.0	1.0	1.0		0.9
Tasmania	0.8	0.5**	1.2	**	0.9
Northern Territory	2.6*	7.8***	1.0	**	2.7***
Australian Capital Territory	1.2	0.8	1.5		1.2
Imputed (v not imputed)	1.4***	1.4***	1.5***		1.6***
Number of observations	17606	8952	8654		17606
Likelihood ratio test (chi-squared)	0.00	0.00	0.00		0.00
Psuedo R-squared	0.67	0.69	0.65		0.29
Predictive Power[4]	93.1	93.3	93.2		81.6
Wald test of set of 2006 dummies (p-value)[2]				0.15	

[1]Base case is indicated in brackets for each group of categorical variables. Standard errors calculated using White's robust variance estimator. [2]Results from a regression of employment status on characteristic type and a set of dummies that interact characteristics with the year 2006. Null hypothesis is that the coefficient on the 2006 characteristic is equal to zero, i.e. no difference in the relative probability of employment between 2006 and 2002 for that characteristic compared to the base case. [3]The same regression, but excluding the work history variables. [4]Employed if probability of employment for that individual greater than 50%.

Table 3: Wald Tests of Significance of Groups of Coefficients in Binomial Logit
Null hypothesis: 2006 coefficients equal to 2002 coefficients; p-values

Age	0.37	Housing tenure	0.53
Education	0.13	Parental status	0.35
Occupation	0.47	Net wealth	0.65
Parent's employment	0.01	Alternative income	0.22
Enrolled	0.37	Debt-to-income ratio	0.83
Work history	0.49	Location	0.07

Table 4A: Multinomial Logit Results of Unemployment Regression
(continued next page)
RRR of unemployment relative to employment [1]

	Pooled	2002	2006	Diff.[2]
2006 year dummy (v 2002)	0.9			
Age (v 36-45 years)				
18-25 years	1.2	1.2	1.3	
26-35 years	1.1	1.0	1.4	
46-55 years	0.9	0.8	1.2	
56-65 years	0.9	0.9	0.9	
Birth country (v Aust)				
English speaking	1.1	1.2	1.1	
Non-english speaking	1.3*	1.5**	1.1	
Education (v university)				
Diploma or certificate	1.4*	1.6**	1.2	
High School	0.9	1.0	0.9	
Less than school	1.2	1.4	1.0	
Occupation (v professional)				
Associate professional	1.0	1.0	0.9	
Trade	0.9	0.9	0.8	
Production	1.9***	1.9**	2.0**	
Unskilled	1.4*	1.6*	1.2	
Father's occupation (v professional)				
Associate professional	0.9	1.0	0.8	
Trade	0.8	0.6**	1.1	*
Production	0.8	0.7*	1.0	
Unskilled	1.3	1.2	1.6*	

Table 4A: Multinomial Logit Results of Unemployment Regression *(cont.)*
RRR of unemployment relative to employment [1]

	Pooled	2002	2006	Diff.[2]
Mother not employed (v employed)	1.0	0.9	1.0	
Student status (v not student)				
Enrolled full-time	0.9	0.7*	1.1	
Finished studies 1-2 years ago	0.7*	0.6	0.7	
Time in work in previous year (v 100%)				
0 per cent	109.9***	143.7***	89.0***	
1-25 per cent	36.8***	36.9***	38.9***	
26-50 per cent	22.4***	24.4***	21.7***	
51-75 per cent	15.6***	16.9***	14.9***	
76-99 per cent	10.2***	11.5***	8.4***	
Time in work since school (v over 50%)	1.4**	1.2	1.6**	
Health condition (v healthy)	1.3*	1.4*	1.2	
Housing tenure (v mortgagee)				
Outright owner	1.0	0.9	1.2	
Renter	0.7*	0.8	0.6	
Family status (v male couple with no child)				
Female	0.8**	0.9	0.6**	
Single with no child	1.3*	1.4	1.2	
Couple, male, child 0-4 years	0.8	0.9	0.7	
Couple, male, child 5-24 years	0.7	0.7	0.6	
Couple, female, child 5-24 years	0.8	0.7	0.9	
Couple, female, child 0-4 years	0.7	1.0	0.4**	
Single, child 0-14 years	1.0	0.8	1.2	
Has non-resident child	0.8	0.8	0.9	
Net wealth (v top quintile)				
1st quintile	5.1***	4.6***	6.0***	
2nd quintile	2.8***	2.6***	3.2***	
3rd quintile	2.5***	2.5***	2.6***	
4th quintile	2.0***	2.2***	1.8*	
Income less own labour income (v top quintile)				
1st quintile	0.7	0.8	0.7	
2nd quintile	0.8	0.8	0.8	
3rd quintile	0.9	0.9	1.0	
4th quintile	0.9	0.9	0.9	

Table 4A: Multinomial Logit Results of Unemployment Regression *(cont.)*

RRR of unemployment relative to employment [1]

	Pooled	**2002**	**2006**	**Diff.[2]**
Debt-to-income ratio (v above 3)				
0	1.8***	1.6*	1.9**	
0-1	1.9***	1.6*	2.3***	
1-3	1.3	1.2	1.5	
Remoteness (v capital city)				
Major city	1.0	1.1	0.9	
Rural	1.0	0.9	1.3	
State or Territory (v NSW)				
Victoria	1.0	1.0	0.9	
Queensland	0.9	1.1	0.7*	
South Australia	0.7**	1.0	0.4***	*
Western Australia	0.7*	0.7	0.8	
Tasmania	0.8	1.6	0.3**	***
Northern Territory	0.3	0.2	0.4	
Australian Capital Territory	0.8	1.4	0.5	
Imputed (v not imputed)	0.7***	0.8**	0.7**	
Number of observations	17606	8952	8654	
Likelihood ratio test (chi-squared)	0.00	0.00	0.00	
Psuedo R-squared	0.53	0.54	0.54	
Predictive Power[4]	87.6	86.8	89.0	
Wald test of set of 2006 dummies (p-value)[2]				0.83

[1]Base case is indicated in brackets for each group of categorical variables. Standard errors calculated using White's robust variance estimator. [2]Results from a regression of employment status on characteristic type and a set of dummies that interact characteristics with the year 2006. Null hypothesis is that the coefficient on the 2006 characteristic is equal to zero, i.e. no difference in the relative probability of employment between 2006 and 2002 for that characteristic compared to the base case.

Table 4B: Multinomial Logit Results of Marginal Attachment Regression
(continued next page)
RRR of unemployment relative to employment [1]

	Pooled	2002	2006	Diff.[2]
2006 (v 2002)	0.9			
Age (v 36-45 years)				
18-25 years	0.7	0.6*	0.8	
26-35 years	1.1	0.8	1.4	*
46-55 years	1.3	1.4*	1.2	
56-65 years	1.5	1.7**	1.3	
Birth country (v Aust)				
English speaking	1.1	1.1	1.0	
Non-english speaking	1.4*	1.3	1.5	
Education (v university)				
Diploma or certificate	1.1*	1.3	0.9	
High School	1.1	1.2	1.1	
Less than school	1.5	1.6**	1.4	
Occupation (v professional)				
Associate professional	1.3	1.3	1.3	
Trade	1.2	1.1	1.1	
Production	1.6***	1.3	1.9**	
Unskilled	1.3*	1.4	1.2	
Father's occupation (v professional)				
Associate professional	1.0	1.2	0.8	
Trade	0.8	0.8	0.9	
Production	0.8	0.6**	0.9	
Unskilled	1.2	1.5*	0.9*	
Mother not employed (v employed)	0.9	0.8*	1.0	
Student status (v not student)				
Enrolled full-time	1.4	1.5*	1.4	
Finished studies 1-2 years ago	0.9*	0.8	1.0	
Time in work in previous year (v 100%)				
0 per cent	353.0***	466.3***	315.5***	
1-25 per cent	33.9***	43.0***	29.0***	
26-50 per cent	26.7***	36.2***	20.9***	
51-75 per cent	17.9***	25.5***	13.4***	*
76-99 per cent	8.8***	8.3***	9.2***	
Time in work since school (v over 50%)	1.1**	1.1	1.1**	
Health condition (v healthy)	1.9*	2.2***	1.6***	

Table 4B: Multinomial Logit Results of Marginal Attachment Regression *(cont.)*

RRR of unemployment relative to employment [1]

	Pooled	2002	2006	Diff.[2]
Housing tenure (v mortgagee)				
Outright owner	1.3	1.4*	1.0	
Renter	0.9*	1.0	0.8	
Family status (v male in couple with no child)				
Female	1.0**	1.0	1.1**	
Single with no child	1.2*	1.0	1.5	
Couple, male, child 0-4 years	0.8	0.8	0.9	
Couple, male, child 5-24 years	0.7	0.7	0.9	
Couple, female, child 5-24 years	1.3	1.5	1.1	
Couple, female, child 0-4 years	4.1	6.2***	2.7***	**
Single, child 0-14 years	2.0	2.0**	2.0	
Has non-resident child	0.7	0.7	0.8	
Net wealth (v top quintile)				
1st quintile	1.8***	1.5	2.2**	
2nd quintile	1.4***	1.1	1.7**	
3rd quintile	1.4***	1.3	1.5**	
4th quintile	1.2***	1.2	1.2*	
Income less own labour income (v top quintile)				
1st quintile	0.5	0.8	0.4***	*
2nd quintile	0.8	1.1	0.6	**
3rd quintile	0.7	0.7	0.7	
4th quintile	0.8	1.0	0.6	
Debt-to-income ratio (v above 3)				
0	1.6***	2.1***	1.4**	
0-1	1.6***	2.2***	1.3**	*
1-3	1.4	2.1***	1.0	**
Remoteness (v capital city)				
Major city	1.0	1.1	0.9	
Rural	1.1	1.2	1.1	

Table 4B: Multinomial Logit Results of Marginal Attachment Regression *(cont.)*

RRR of unemployment relative to employment [1]

	Pooled	2002	2006	Diff.[2]
State or Territory (v NSW)				
Victoria	1.1	1.0	1.2	
Queensland	1.1	1.1	1.1*	
South Australia	1.0**	1.0	1.1**	
Western Australia	0.8*	1.0	0.6	
Tasmania	1.6	2.1**	1.4**	
Northern Territory	0.5	0.2**	0.7	
Australian Capital Territory	0.6	0.7	0.6	
Imputed (v not imputed)	0.7***	0.7**	0.7***	
Wald test of set of 2006 dummies (p-value)[2]				0.11

[1]Base case is indicated in brackets for each group of categorical variables. Standard errors calculated using White's robust variance estimator. [2]Results from a regression of employment status on characteristic type and a set of dummies that interact characteristics with the year 2006. Null hypothesis is that the coefficient on the 2006 characteristic is equal to zero, i.e. no difference in the relative probability of employment between 2006 and 2002 for that characteristic compared to the base case.

Table 4C: Multinomial Logit Results of Not in the Labour Force Regression

(continued next page)

RRR of unemployment relative to employment [1]

	Pooled	2002	2006	Diff.[2]
2006 (v 2002)	1.1			
Age (v 36-45 years)				
18-25 years	0.6***	0.6*	0.6**	
26-35 years	1.0	0.9	1.2	
46-55 years	1.9***	2.0***	1.9***	
56-65 years	5.0***	5.7***	4.6***	
Birth country (v Aust)				
English speaking	0.9	1.0	0.9	
Non-english speaking	1.4***	1.6***	1.2	
Education (v university)				
Diploma or certificate	1.3**	1.8***	1.0	**
High School	1.2	1.5*	1.0	
Less than school	1.8***	2.6***	1.2	***
Occupation (v professional)				
Associate professional	1.2	1.1	1.3	
Trade	1.3	1.0	1.6*	
Production	1.4*	1.2	1.5	
Unskilled	1.1	1.2	1.0	
Father's occupation (v professional)				
Associate professional	0.9	1.2	0.7*	**
Trade	0.8**	0.7**	0.9	
Production	0.9	0.8	0.9	
Unskilled	1.1	1.1	1.0	
Mother not employed (v employed)	1.0	0.9	1.0	
Student status (v not student)				
Enrolled full-time	1.3	1.2	1.5*	
Finished studies 1-2 years ago	0.6**	0.7	0.6**	
Time in work in previous year (v 100%)				
0 per cent	584.3***	721.5***	554.6***	
1-25 per cent	37.0***	50.3***	26.3***	*
26-50 per cent	21.0***	28.7***	15.4***	*
51-75 per cent	22.3***	27.3***	18.9***	
76-99 per cent	15.3***	16.1***	14.1***	
Time in work since school (v over 50%)	1.3**	1.2	1.5**	

Table 4C: Multinomial Logit Results of Not in the Labour Force Regression
(cont.)
RRR of unemployment relative to employment [1]

	Pooled	2002	2006	Diff.[2]
Health condition (v healthy)	2.5***	3.0***	2.2***	
Housing tenure (v mortgagee)				
Outright owner	1.1	1.1	1.1	
Renter	0.7**	0.9	0.7*	
Family status (v male couple with no child)				
Female	1.6***	2.0***	1.3*	*
Single with no child	0.9	0.7*	1.1	*
Couple, male, child 0-4 years	0.6*	0.4**	0.9	
Couple, male, child 5-24 years	0.7**	0.6*	0.8	
Couple, female, child 5-24 years	0.8	0.8	0.9	
Couple, female, child 0-4 years	5.6***	6.4***	5.8***	
Single, child 0-14 years	0.9	0.8	1.0	
Has non-resident child	0.6***	0.6**	0.6**	
Net wealth (v top quintile)				
1st quintile	1.1	1.0	1.2	
2nd quintile	1.1	1.2	0.9	
3rd quintile	1.2	1.3	1.2	
4th quintile	1.1	1.3	0.9	
Income less own labour income (v top quintile)				
1st quintile	0.5***	0.8	0.4***	**
2nd quintile	0.8	0.9	0.8	
3rd quintile	0.7**	0.8	0.7*	
4th quintile	0.7**	0.9	0.6**	
Debt-to-income ratio (v above 3)				
0	2.2***	2.3***	2.1***	
0-1	1.6***	1.8***	1.4*	
1-3	1.1	1.2	1.1	
Remoteness (v capital city)				
Major city	0.9	0.8	1.0	
Rural	1.0	0.8	1.3	**

Table 4C: Multinomial Logit Results of Not in the Labour Force Regression
(cont.)
RRR of unemployment relative to employment [1]

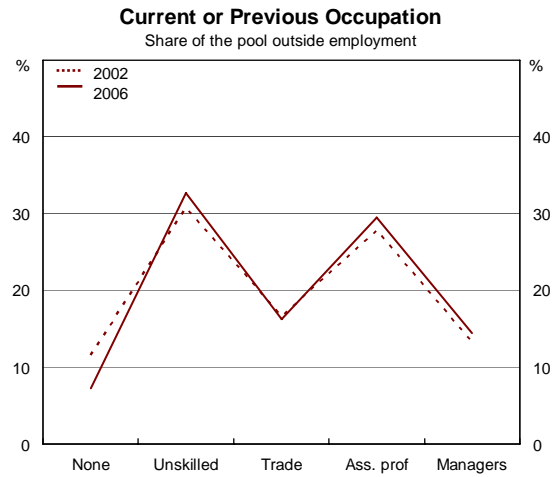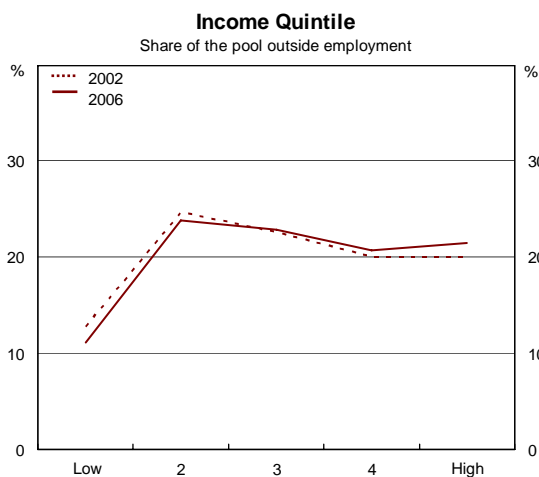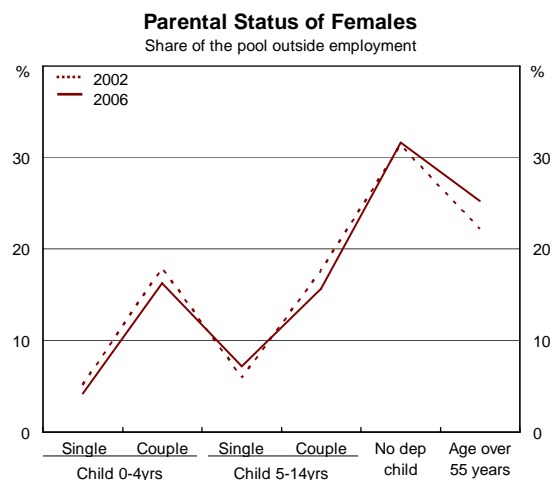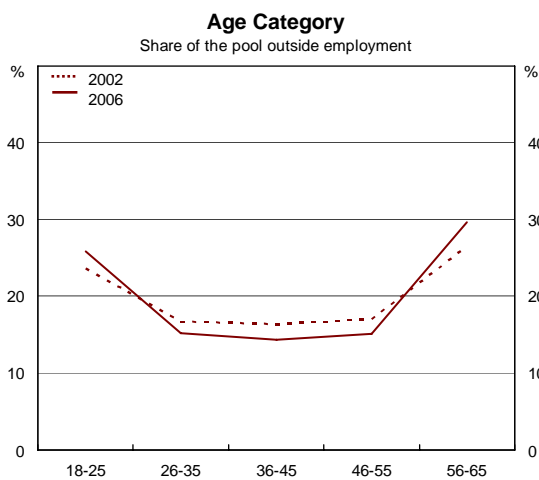| State or Territory (v NSW)				
Victoria	1.2	1.0	1.3*	
Queensland	1.3**	1.2	1.4**	
South Australia	1.1	1.2	1.1	
Western Australia	1.2	1.2	1.3	
Tasmania	1.5*	2.1**	1.1	
Northern Territory	0.4	0.1***	1.5	**
Australian Capital Territory	1.0	1.3	0.8	
Imputed (v not imputed)	0.6***	0.7***	0.6***	
Wald test of set of 2006 dummies (p-value)[2]				0.05
Memo item: Wald test of set of 2006 dummies across				
U, MA and NILF regressions (p-value)[2]				0.13

[1]Base case is indicated in brackets for each group of categorical variables. Standard errors calculated using White's robust variance estimator. [2]Results from a regression of employment status on characteristic type and a set of dummies that interact characteristics with the year 2006. Null hypothesis is that the coefficient on the 2006 characteristic is equal to zero, i.e. no difference in the relative probability of employment between 2006 and 2002 for that characteristic compared to the base case.

Table 5: Wald Tests of Significance of Groups of Coefficients in Multinomial Logit
Null hypothesis: 2006 coefficients equal to 2002 coefficients; p-values

	Unemployment	**Marginal attachment**	**NILF**
Age	0.63	0.16	0.66
Education	0.64	0.71	0.05
Own occupation	0.86	0.66	0.43
Parent's employment	0.21	0.03	0.03
Enrolled	0.23	0.84	0.77
Work history	0.68	0.52	0.36
Housing tenure	0.41	0.53	0.59
Parental status	0.45	0.16	0.10
Net wealth	0.82	0.71	0.46
Alternative income	0.91	0.14	0.14
Debt-to-income ratio	0.14	0.14	0.76
Location	0.06	0.73	0.04

Appendix C: The Pool Outside Employment in 2002 and 2006

Age Category
Share of the pool outside employment

Parental Status of Females
Share of the pool outside employment

Income Quintile
Share of the pool outside employment

Current or Previous Occupation
Share of the pool outside employment

Highest Education Attainment
Share of the pool outside employment

Wealth Quintile
Share of the pool outside employment
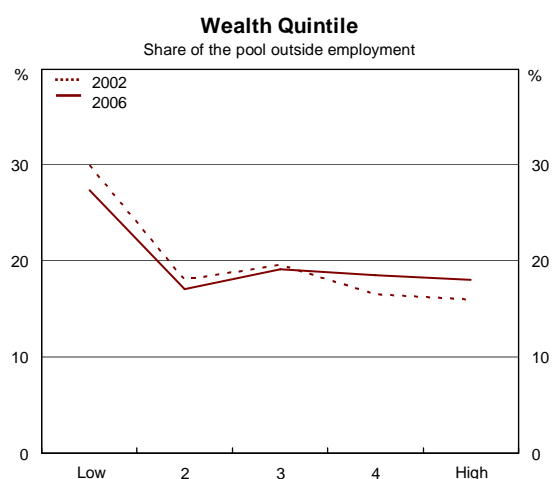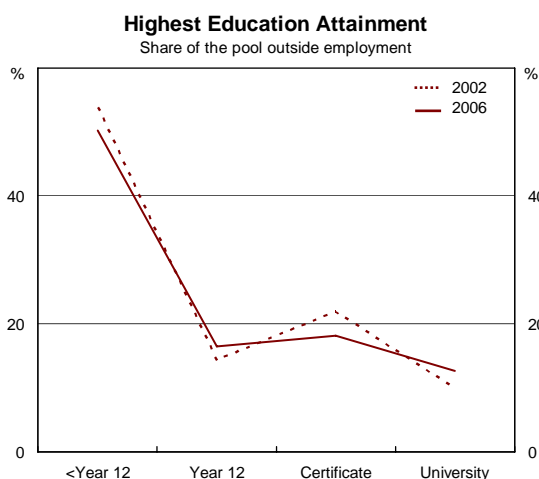
Source: HILDA Wave 6.0

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