The Australian National University

Centre for Economic Policy Research

DISCUSSION PAPER

Do You Need a Job to Find a Job?

Deborah Cobb-Clark[1], Paul Frijters[2] and Guyonne Kalb[3]

DISCUSSION PAPER NO. 497
September 2005

ISSN: 1442-8636
ISBN: 0 7315 3567 7

[1]SPEAR Centre and Economics Program, RSSS, Australian National University and IZA. [2]Economics Program, RSSS, Bldg 9, Australian National University, Canberra ACT 0200 Australia; fax: (61)2-6125-0182; e-mail: paul.frijters@anu.edu.au. [3]Melbourne Institute of Applied Economic and Social Research, and Centre for Microeconometrics, University of Melbourne

Acknowledgements
We would like to acknowledge funding from the Department of Family and Community Services for the research on which part of this paper is based. However, the views expressed in this paper are those of the authors and do not represent the views of the Minister for Family and Community Services or the Commonwealth Government.

ABSTRACT

This paper investigates whether job offers arrive more frequently for those in employment than for those in unemployment. To this end, we take advantage of a unique Australian data set which contains information on both accepted and rejected job offers. Our estimation strategy takes account of the selectivity associated with the initial employment state and we allow for individual heterogeneity in the probability of obtaining jobs. Our results reveal that, across the wage range, individuals are about equally likely to obtain a job offer in employment as in unemployment. This implies that encouraging unemployed (rather than employed) search through the provision of unemployment benefits does not improve the speed of a job match.

Keywords: job-offer arrival rates, reservation wages, wage-offer distribution, directed search

JEL Classifications: C41, C14, J64

1 Introduction

Who receives more acceptable job offers, the unemployed or the employed? Answering this question is important for several reasons. First, if unemployed search is more effective than employed search a case can be made that risk aversion amongst the unemployed or externalities in the search process warrant the subsidising of unemployment. The argument – made at least as early as Burdett (1979) – is that if job offers in employment arrive infrequently then an initial 'bad choice' cannot be easily corrected resulting in less efficient outcomes. Marimon and Zilibotti (1999), for example, argue that individuals who accept unsuitable jobs reduce the availability of such jobs for others who are better suited. Consequently, bad job matches made by the unemployed out of financial necessity should be avoided. These views have led many to advocate using unemployment benefits to subsidise unemployed job search as a means of increasing efficiency in the labour market (for example, Marimon and Zilibotti, 1999; Acemoglu and Shimer, 1999).

At the same time, if the employed receive at least as many job offers as the unemployed, then arguments in favour of unemployment benefits as a search subsidy become less valid. Indeed, if job offers arrive more frequently during employment then subsidising unemployment may lead to higher unemployment levels and be counterproductive.

Second, there are also theoretical reasons to be concerned about relative job-offer arrival rates. Assumptions about the relative frequency of job offers during employment and unemployment form a key component of many job search models. The standard Burdett and Mortensen (1998) model of wage heterogeneity amongst homogeneous individuals presumes for example that employed and unemployed job-offer arrival rates are the same. Empirical applications of

this model, such as in Bontemps et al. (2000) depend upon the plausibility of this assumption as does the theoretical framework in Ljungqvist and Sargent (1998). On the other hand, Van den Berg (1990), Frijters and Van der Klaauw (2001), and Flinn and Heckman (1982) assume that the job-offer arrival rate for the employed is zero and applications of these models rest heavily on this assumption.

Despite the importance of the issue, the empirical evidence is limited. Early results for US youth suggest that search intensity is higher in unemployment than in employment, resulting in more job offers while unemployed, although the estimated wage returns to unemployed search are not necessarily higher (see Kahn and Low, 1982; 1984; Holzer, 1987). At the same time, employed search is significantly more efficient than unemployed search for Dutch students (Van der Klaauw et al., 2004), while Pissarides and Wadsworth (1994) show that twice as many workers in the UK choose on-the-job search rather than quitting into full-time search, indicating that workers themselves see a relative benefit in searching on the job. Moreover, Jackman et al. (1989) argue that in the UK the efficiency of job search by the unemployed declined relative to the efficiency of employed job search in the decades leading up to 1989.

Our objective is to shed new light on these issues by investigating whether 'acceptable' job offers occur more frequently in employment than in unemployment. To this end, we take advantage of a large panel survey of relatively disadvantaged job seekers in Australia who – while not necessarily representative of labour market participants as a whole – are most directly the focus of public policies targeting the unemployed. We avoid the selectivity associated with initial employment state by utilising information on rejected job offers for individuals who are observed searching for jobs both in employment and in unemployment. Using this identification strategy, we then non-parametrically estimate separate employed and unemployed

wage-offer distributions. Unlike alternative data sources, our data provide information over a period of three years about monthly (as opposed to annual) job offers, the beginning and end dates of both employed and unemployed search spells, and annual reports of reservation wages. Detailed information about search outcomes (including rejected job offers) for large samples of employed and unemployed job seekers is fairly uncommon and allows us to account for selectivity associated with initial employment state as well as the endogeneity of search effort.

Our results are robust across a number of specifications and indicate that the intensity and efficiency of search is slightly lower in employment than in unemployment. However, offer arrival rates do not differ significantly implying that employed and unemployed job seekers in Australia are essentially equally likely to receive acceptable job offers. Although differences in estimation samples and empirical methods make direct comparisons difficult, our results fall between previous results from Northern Europe which indicate that the unemployed are less likely to receive job offers and US evidence which suggests that unemployed job search is perhaps more efficient than employed search.

The outline of the paper is as follows. In the next section, we set out our theoretical framework and derive our estimation equations. In Section 3, we describe the data and focus on the unconditional ratio of employed to unemployed job-offer arrival rates. Following that, we present our estimation results paying particular attention to placing our results in the context of the wider international literature. Conclusions are given in Section 5.

2 The Institutional Setting

Unlike in many other countries, unemployment benefits in Australia are funded from general tax revenues and form one component of the wider income-support system. Unemployment insurance – in which eligibility is based on former employment and benefits levels are linked to previous earnings – is not available. Consequently, benefit levels are driven only by a household's composition, income, and assets (excluding the family home). Moreover, benefits are available for an unlimited period, although recipients must be actively searching for employment in order to qualify.[1]

Over our period of analysis, Australian unemployment ranged between 9.0 per cent in September 1994 to 8.2 per cent in September 1997. Unemployment was at its lowest in July 1995 at 7.5 per cent, but was concentrated around 8 per cent for much of the period. Over this period, Australian unemployment benefits provided a basic income level for eligible recipients. In particular, single individuals could receive a maximum unemployment benefit of $320 per fortnight in early 1997, while individuals in couple families could receive up to $290 per fortnight.[2] After a small earnings allowance – approximately $60 per fortnight for single individuals – taper rates of between 50 and 70 per cent applied. Benefit entitlement completely ended once individuals earned between $500 (individuals in a couple families) and $540 (single individuals) per fortnight.

[1] Sole parents with children under the age of 16 are entitled to a sole parent pension which does not require that recipients acitvely engage in job search.

[2] In comparison, full-time average earnings were on average $694.10 in February 1997, while average earnings were $581.60 (ABS, 2004: Table 3 Average Weekly Earnings Of Employees, Australia (Dollars) - Original).

3 The Model

3.1 Theoretical Framework

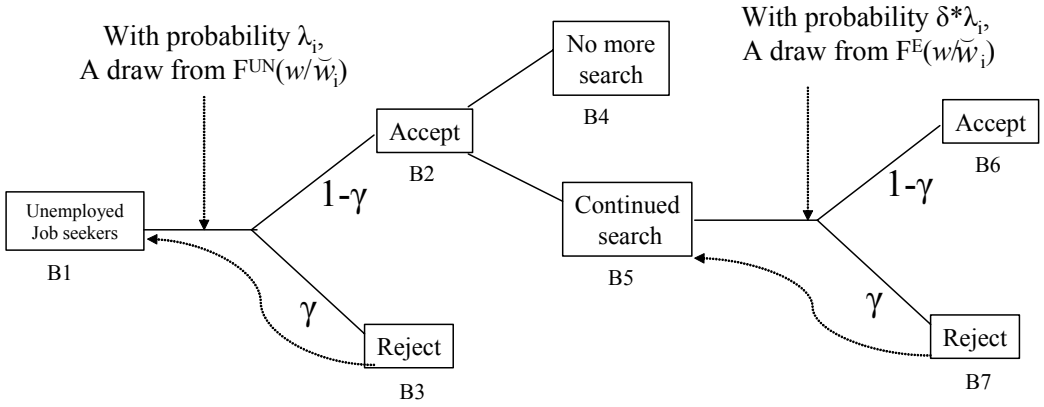
Our goal is to develop a theoretical framework which captures the essence of the job search process, exploits the relative strengths of our data (see the discussion below), and provides a sensible backdrop against which to interpret our results. To this end, we develop a semi-structural model which allows us to deal with the selectivity of those in employment, fixed-effects in wage-offer distributions, and unobserved heterogeneity in job-offer arrival rates.

We begin by taking a simplified stationary job-search environment in which individuals undertake directed (or systematic) search in order to find jobs (see for example, Kahn and Low, 1988; 1990; Gregg and Petrongolo, 2000). While undirected (or random) search would result in job offers periodically arriving from randomly encountered employers, directed search implies that an unemployed individual i only applies for jobs that pay a wage higher than or equal to his or her individual-specific reservation wage ($\breve{w}_i$). Empirical evidence suggests that directed search is quite common (Kahn and Low, 1988; 1990). Moreover, a directed search framework seems reasonable given the self-reported nature of job offers in our data. In fact, nearly all unemployed job seekers have latent job offers to become self-employed street vendors or floor sweepers at the nearest fast-food restaurant. These latent, low-paid job offers are clearly not what people mean when they report to have had a job offer. Reported job offers are in some sense 'serious' offers, and hence better fit a directed search view of the labour market.

As an illustration, the search process for a sample of job seekers who are initially unemployed

is outlined in Figure 1.[3]

Figure 1: The Stocks of Individuals in the Sample



In each period, individuals are assumed to have an individual-specific job-offer arrival rate λ_i. An observed job offer for an unemployed individual consists of a relative wage offer drawn from a distribution $F^{UN}(\frac{w}{\breve{w}_i})$ where w is the offered wage and $\breve{w}_i$ is the individual-specific reservation wage. In other words, the probability of obtaining a specific wage offer w depends on the level of that wage offer relative to the individual's reservation wage. Our directed search framework implies that $F^{UN}(\frac{w}{\breve{w}_i}) = 0$ for $\frac{w}{\breve{w}_i} < 1$.[4] Job offers are assumed to be rejected with an exogenous probability γ because, for example, the non-monetary aspects of the job turn out to be unsatisfactory or family circumstances prevent a change of job.[5]

At the start of the next period, individuals make a new decision to either continue or to end their job search. In particular, some individuals who are initially unemployed will receive and

[3]Some individuals engaged in unemployed search may have been employed in previous periods, while others may never have been employed.

[4]In Section 5 we discuss the extent to which this assumption holds in our sample.

[5]In particular, Devine and Kiefer (1991) note that differences in job search outcomes are mainly due to differences in arrival rates rather than to differences in the probability of rejecting offers. We consider the robustness of our results to this assumption in the results section.

accept a job offer, but continue their job search while employed. An employed job seeker is assumed to obtain job offers with arrival rate $\lambda_i * \delta$ from a distribution $F^E(\frac{w}{\breve{w}_i})$. Disparity between $F^E(\frac{w}{\breve{w}_i})$ and $F^{UN}(\frac{w}{\breve{w}_i})$ stems from the possibility that the job pools to which individuals have access may depend on their employment status, while we can think of δ as capturing the relative search intensity of employed individuals in comparison to their unemployed counterparts.

This theoretical framework is useful in that it allows us to focus directly on the effectiveness of directed employed and unemployed job search. An obvious alternative to this approach, would be to capture differences in employed and unemployed job search by allowing the reservation wage itself to depend on whether an individual is currently employed or unemployed (as in Frijters and Kalb, 2003). Our preliminary estimation, however, suggests that individuals' reservation wages do not change substantially when they either gain or lose jobs (see Appendix Table A.1). Similarly, we also do not observe significant wage increases as a result of job changes. These findings most likely stem from the fact that our sample is dominated by low-skilled individuals for whom the main reason to change jobs is related to travel, family, and job security considerations. Given this, we model reservation wages as individual-specific and independent of current employment status.

3.2 Estimation Strategy

We are interested in estimating whether job offers occur more frequently in employment than in unemployment. The theoretical framework outlined in Section 3.1 suggests that the relative frequency of job offers is a function of both relative search intensity in the two labour market states (δ) and divergence in wage offer distributions ($F^E(\frac{w}{\breve{w}_i})$ and $F^{UN}(\frac{w}{\breve{w}_i})$). Consequently,

our empirical strategy centres around estimating the relative arrival rate of jobs that pay at least $\frac{w}{\breve{w}_i}$ in employment versus unemployment which we denote as $R(\frac{w}{\breve{w}_i})$. Specifically,

$$R(\frac{w}{\breve{w}_i}) = \delta(1 - F^E(\frac{w}{\breve{w}_i}))/(1 - F^{UN}(\frac{w}{\breve{w}_i})) \tag{1}$$

where equation (1) can be evaluated across the range of relative wage offers $(\frac{w}{\breve{w}_i})$.

Various econometric issues need to be addressed in the estimation of equation (1). We begin by considering the potential selectivity associated with initial employment state. When our data window opens, our sample of job seekers will include some individuals who are currently unemployed and some individuals who were initially unemployed, but then accepted a job offer and chose to continue to search while employed.[6] The difficulty is that individuals observed in jobs at the start of the data period are not a random sample of all job seekers as those individuals with extremely low λ_i are less likely to be observed in employment than those with high λ_i. In effect, initial employment state is likely to be correlated with a job seeker's individual-specific probability of receiving a wage offer. The extent to which this might result in biased estimates is an empirical question. Kahn and Low (1982) find, for example, that estimates correcting for the selectivity bias associated with initial employment state suggest that unemployed job seekers receive more offers than employed job seekers do, though uncorrected results demonstrate the opposite. In order to circumvent this potential initial conditions problem, we restrict the estimation sample to those individuals whom we observe both in employment and unemployment over the data period. We can then compare the search intensity of individuals in employment with their own search intensity in unemployment.

[6] These are groups B1 and B5 respectively in Figure 1.

This sample restriction – while useful in dealing with unobserved heterogeneity – makes it difficult to generate estimates of the unconditional, relative search efficiency in employment versus unemployment across the entire sample of job seekers. In effect, the sample support includes only those individuals who have received at least one acceptable job offer whilst unemployed. Without additional structure regarding the relationship between employment state and individual heterogeneity in job-offer arrival rates (λ_i) it would be difficult to recover unconditional estimates of $R(\frac{w}{\widetilde{w}_i})$ from this restricted sample if we were to base the estimation on accepted job offers.

Consequently, we adopt a multi-step estimation strategy. We first estimate the relative intensity of employed versus unemployed search (δ) disregarding accepted job offers and instead using only data on the arrival rate of rejected job offers in employment versus unemployment. Rejected job offers do not suffer from the same truncation problem (as accepted offers would) because the sample selection rule we have imposed is not based on rejected job offers.[7]

More specifically, rejected job offers arrive at a rate $\widetilde{\lambda}_i = \gamma\lambda_i$ for the unemployed and a rate $\delta\widetilde{\lambda}_i = \delta\gamma\lambda_i$ for the employed. For each individual i we observe a sequence $\{d_{i1}, .., d_{iT}\}$ whereby d_{i1} is an indicator function for the existence of a rejected job offer in period $t = \{1...T\}$. Here, time runs only over those periods in which an individual reports active job search and may hence contain disjoint periods. The set of relevant time periods is denoted as S_i. For each individual, we also define a sequence of indicators $\{E_{i1}, .., E_{iT}\}$ that denote whether an individual is in employment or not.

[7] In effect, δ and λ_i are estimated simultaneously by using the restricted sample to compare the likelihood that individuals in unemployed search (B1) will reject a wage offer (i.e., move to B3) in comparison to the likelihood that individuals engaged in employed search (B5) will reject a wage offer (i.e., move to B7). See Figure 1.

We use maximum likelihood estimation to generate an estimate of the relative intensity of employed versus unemployed search, δ. The likelihood of the observed sequence of rejected job offers in terms of the model parameters is given by

$$L_i = \int \left(\prod_{t \in S_i} \left(\widetilde{\lambda}_i \delta^{E_{it}} \right)^{d_{it}} \left(1 - \widetilde{\lambda}_i \delta^{E_{it}} \right)^{1-d_{it}} \right) dG(\widetilde{\lambda}_i) \tag{2}$$

where $G(\widetilde{\lambda}_i)$ denotes the distribution of $\widetilde{\lambda}_i$.[8] This likelihood is integrated over the distribution of possible job-offer arrival rates, $G(\widetilde{\lambda}_i)$ for both employed and unemployed individuals and the integral should be read in the Lebesque sense.[9] We thus allow for heterogeneity in the rejected job-offer arrival rate through our choice of distributions for $\widetilde{\lambda}_i$ (see Section 4).[10]

In the second step, we use information regarding accepted wage offers to identify the wage-offer distributions $F^E(\frac{w}{\breve{w}_i})$ and $F^{UN}(\frac{w}{\breve{w}_i})$ assuming that reservation wages are individual-specific and stationary over time.[11] Basing the estimation on accepted wage offers does not generate a sample selection problem, because any wage offer exceeding the reservation wage is assumed to

[8] To see this note that for the unemployed $E_{it} = 0$ and the likelihood becomes $\int \left(\prod_{t \in S_i \setminus E_{it}=1} \left(\widetilde{\lambda}_i \right)^{d_{it}} \left(1 - \widetilde{\lambda}_i \right)^{1-d_{it}} \right) dG(\widetilde{\lambda}_i)$ where $\widetilde{\lambda}_i$ is the probability of observing a rejected job offer and $\left(1 - \widetilde{\lambda}_i \right)$ is the probability of not observing a rejected job offer. For employed individuals, however, $E_{it} = 1$ and the likelihood becomes $\int \left(\prod_{t \in S_i \setminus E_{it}=0} \left(\widetilde{\lambda}_i \delta \right)^{d_{it}} \left(1 - \widetilde{\lambda}_i \delta \right)^{1-d_{it}} \right) dG(\widetilde{\lambda}_i)$ where $\widetilde{\lambda}_i \delta$ is the probability of observing a rejected job offer and $\left(1 - \widetilde{\lambda}_i \delta \right)$ is the probability of not observing a rejected job offer.

[9] This implies that when $G(.)$ is a discrete distribution, the integral becomes a simple sum over all mass-points.

[10] In particular, we use both discrete mass-point and lognormal distributions to approximate the distribution of $\widetilde{\lambda}_i$.

[11] In effect, $F^E(\frac{w}{\breve{w}_i})$ is estimated from the wage offers received by the sample of job seekers in B6, while $F^{UN}(\frac{w}{\breve{w}_i})$ is estimated using the wages offers of individuals in B2. (See Figure 1.)

be rejected with an exogenous probability γ. This leads wage offers to be independent of the probability that serious wage offers (i.e., those exceeding the reservation wage) will be accepted implying that the sample selection rule is independent of the outcome of interest. Estimated wage distributions $\hat{F}^E(\frac{w}{\breve{w}_i})$ and $\hat{F}^{UN}(\frac{w}{\breve{w}_i})$ are computed non-parametrically by taking $\hat{f}^E(\frac{w}{\breve{w}_i})$ and $\hat{f}^{UN}(\frac{w}{\breve{w}_i})$ to be piece-wise constant.

Using estimates derived in these two steps, we then construct our measure of the relative arrival rate of acceptable job offers, $R(\frac{w}{\breve{w}_i})$, given in equation (1). Specifically,

$$\hat{R}(w) = \hat{\delta}(1 - \hat{F}^E(\frac{w}{\breve{w}_i}))/(1 - \hat{F}^{UN}(\frac{w}{\breve{w}_i})). \tag{3}$$

We can only derive a lower bound for the error in this estimate of $R(\frac{w}{\breve{w}_i})$. Specifically, the error is at least as high as that caused by the uncertainty in $\hat{\delta}$ and by the finite-sample uncertainty in $\hat{F}^E(\frac{w}{\breve{w}_i})$ and $\hat{F}^{UN}(\frac{w}{\breve{w}_i})$. To be more precise regarding the finite-sample uncertainty in $\hat{F}^E(\frac{w}{\breve{w}_i})$ and $\hat{F}^{UN}(\frac{w}{\breve{w}_i})$, suppose n_1 out of N individuals accepted a wage higher than a certain $\frac{w^*}{\breve{w}_i}$ during employment. Standard asymptotic distribution theory then tells us that

$$Std.Error\left[\hat{F}^{UN}(\frac{w^*}{\breve{w}_i})\right] = \frac{\sqrt{\frac{n_1}{N} * \frac{N-n_1}{N}}}{\sqrt{N}}. \tag{4}$$

Confidence intervals can be constructed for $\hat{R}$ by means of bootstrapping from the separately estimated confidence intervals around $\hat{\delta}$ and $\hat{F}^E(\frac{w}{\breve{w}_i})$ and $\hat{F}^{UN}(\frac{w}{\breve{w}_i})$.

4 Survey of Employment and Unemployment Patterns

We utilise data derived from the Australian Bureau of Statistics' (ABS) Survey of Employment and Unemployment Patterns (SEUP), which detail the work and job-seeking experiences of individuals over the three-year period 1994 - 1997.[12] The public use sample includes 7572 respondents, the majority of whom were either actively seeking work or likely to be entering the labour market at the time of recruitment.[13] Consequently, our focus is on the job-offer arrival rates of a relatively homogenous, disadvantaged group at risk of unemployment. Given our interest in understanding the nexus between job offers, reservation wages, and search behaviour, we have excluded full-time students, family workers and self-employed individuals from the sample, so that 5223 individuals remain.[14] The SEUP data can be combined to form sequences of work and non-work spells. Periods of job search are also recorded so that a job search indicator can be constructed for each work/non-work spell. Of the 2315 individuals who are observed to engage in job search at some point in the period, we selected the 1577 individuals who are observed in both employment and unemployment. These individuals constitute our estimation sample.

[12] The SEUP sampling frame consists of three separate random samples from the wider Australian population aged 15 to 59 residing in private dwellings: 1) individuals seeking jobs; 2) a population reference group; and 3) individuals participating in a labour market program. The public-use data include information about the first two samples only and consequently, individuals participating in labour market programs have been excluded from the analysis. For more detailed information about the SEUP data see ABS, (1997; 1998).

[13] The job seeker group comprises those who, at the time of recruitment (April-June 1995), were: unemployed, underemployed (working less than ten hours per week and looking for a job with more hours), discouraged from job search or not in the labour force but likely to enter the labour force in the near future. Thus this group is sampled from a stock of unemployed/underemployed individuals rather than the inflow of unemployed and as a result they are selected to be more disadvantaged than the average person entering unemployment.

[14] Full-time students are excluded because for them full-time study provides an additional alternative to work and non-work. Self-employed individuals and family workers are excluded because a participation decision based on reservation and market wages is not relevant for them in the same way as it is for wage and salary earners.

For each of the work spells identified in the SEUP data, job information such as earnings, hours of work, occupation and industry is available. Wage-related information in the data includes reservation wages for all individuals seeking work (independent of their current employment status), acceptance wages in new jobs that occur after a non-working spell, and wages in current jobs.[15] Finally, individuals seeking work reported the timing of any job offers along with an indication of whether the offer had been accepted or rejected.

This information is used to construct the main variables of interest. In particular, we constructed a monthly indicator variable for the arrival of at least one job offer as well as indicators of whether specific job offers were accepted or not. We also constructed a measure of acceptance wages. This information is directly reported for new jobs that follow a spell of non-work. For new jobs that follow employment spells, the acceptance wage equals the first reported wage after the new job begins. In both cases, we replaced the relevant categorical wage with a prediction based on all available individual information (including, for example, education, occupation, hours of work and experience) and the reported wage category. Similarly, we constructed individual reservation wages by estimating a model of reservation wages (including fixed individual-specific effects), and calculating a predicted reservation wage for individuals who have just become unemployed (see Table A1).[16]

In order to highlight the underlying patterns in the data, summary statistics for the main variables of interest are given in Table 1 by gender, employment status, job-search status and disability status. Additionally, job-offer arrival rates are shown for individuals who are out of

[15] SEUP wage information is reported categorically.

[16] Specifically, each individual is assigned the expected value from his or her predicted wage distribution conditional on the reported wage interval. Hourly wages were asked in 29 brackets; reservation wages in 30 brackets. This makes the predicted (reservation) wages extremely close to actual (reservation) wages: the margin for error is less than 2 per cent when one takes predictions within each bracket.

the labour market or who are employed and not actively seeking employment. Interestingly, the raw data reveal only slight differences in job-offer arrival rates between employed and unemployed job seekers. While the employed who are searching for new jobs receive an offer every 151 days on average, the unemployed receive job offers every 141 days. There also appears to be little difference in job-offer arrival rates for unemployed men and women. On average, unemployed men in the sample receive a job offer every 179 days, while unemployed women receive job offers on average every 167 days. The gender gap in offer arrival rates amongst the employed is even smaller.

Table 1: Summary Statistics for the Dependent Variables

	Actual Wage	Reserv. Wage 1	Reserv. Wage 2	Reserv. Wage 3	Job Offers. Per Day	Expected Days Before an Offer
not in employment		11.06	10.82	11.15	0.0058	172
by labour market status						
out of the labour force					0.0032	312
unemployed		11.06	10.82	11.15	0.0071	141
by gender						
men		11.54	10.82	11.35	0.0056	179
women		10.60	10.82	10.90	0.0060	167
by disability status						
yes		11.09	10.94	11.06	0.0047	213
no		11.04	10.77	11.21	0.0064	156
in employment	13.73	11.39	11.33	11.97	0.0038	263
by labour market status						
work, no search	13.69				0.0026	385
work and search	13.85	11.39	11.33	11.97	0.0066	151
by gender						
man	13.99	12.34	11.64	12.49	0.0037	270
woman	13.46	10.50	10.99	11.41	0.0038	263
number of obs.	7852	1102	2740	2493	18257	18257

Moreover, the reservation wages of employed searchers ($11.39 in the first job) are slightly

higher than for unemployed searchers ($11.06), but the difference is small. Men have both higher reservation wages and higher actual wages than women. The wages of those who continue searching while employed and those who stop searching are also essentially the same which most likely stems from the similarities in the demographic and human capital characteristics of the employed and unemployed job seekers in our sample (see Table 2). In particular, although employed job seekers have somewhat more human capital than their unemployed counterparts, these differences are in general quite modest.

5 Results

Our goal is to estimate whether employed or unemployed job search is relatively more effective in producing acceptable wage offers for low-skilled individuals. If employed search is at least as effective as unemployed search, then arguments that unemployed job search should be subsidized through the provision of unemployment benefits become less valid. If, in fact, low-skilled individuals are more likely to receive job offers whilst employed then policies which view part-time or casual employment as stepping stones to longer-term employment stability may be preferred. The theoretical framework outlined in Section 3 leads us to have a preference for estimating the relative arrival rate of acceptable job offers – see equation (1) – using information on rejected wage offers from the subsample of job seekers who are observed to engage in both employed and unemployed job search at some point in the data period. In this section we discuss the results from this estimation procedure and consider how robust these results are to the various assumptions we have made.

Table 2: Descriptive Statistics for Job Seekers by Employment Status

	Total Job Seekers		Unemployed Job Seekers		Employed Job Seekers	
Demographic Characteristics	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
female	0.447	0.497	0.446	0.497	0.450	0.498
age	35.753	10.801	35.901	10.920	35.396	10.501
partnered	0.556	0.497	0.557	0.497	0.556	0.497
number of children	0.774	1.096	0.783	1.101	0.751	1.084
Youngest child is:						
aged 0	0.051	0.219	0.052	0.222	0.048	0.213
aged 1 to 2	0.081	0.272	0.085	0.279	0.070	0.255
aged 3 to 5	0.095	0.293	0.094	0.292	0.097	0.296
aged over 5	0.126	0.332	0.126	0.332	0.127	0.333
Australian born	0.730	0.444	0.715	0.451	0.764	0.424
Human Capital Characteristics						
Years of job search since school	2.759	3.119	2.893	3.171	2.436	2.965
Disabled	0.318	0.466	0.330	0.470	0.290	0.454
English is spoken at home	0.902	0.298	0.889	0.314	0.932	0.252
Education						
higher degree/post-doctoral	0.019	0.136	0.018	0.131	0.022	0.148
bachelors degree	0.070	0.255	0.060	0.238	0.093	0.290
undergraduate diploma	0.059	0.237	0.058	0.234	0.062	0.242
skilled vocational qualification	0.168	0.374	0.167	0.373	0.172	0.378
basic vocational qualification	0.063	0.243	0.063	0.243	0.064	0.245
finished secondary school	0.174	0.379	0.170	0.376	0.181	0.385
left secondary aged 16-18	0.199	0.399	0.205	0.404	0.183	0.387
left secondary aged less than 15	0.248	0.432	0.259	0.438	0.222	0.416
Part-time student	0.074	0.262	0.070	0.255	0.085	0.279
Work experience in years	13.432	11.039	13.358	11.130	13.610	10.817
Number of observations	9599		6781		2818	

5.1 Job Search Effectiveness

The likelihood function we are seeking to maximise is given in equation (2). Several alternative specifications can be used to approximate the distribution of the arrival rate of rejected job offers across individuals, $G(\widetilde{\lambda}_i)$. The most flexible possibility is to take a discrete distribution for $G(\widetilde{\lambda}_i)$ with K points of support. In other words, we assume that

$$\begin{aligned} P[\widetilde{\lambda}_i &= e^{x_i\beta}\theta_k|x_i] = p_k \\ 1 &\geq p_k \geq 0 \\ 1 &> \theta_k > 0 \\ \sum_{k=1}^{K} p_k &= 1 \end{aligned}$$

which for large K can approach any distribution function. This framework allows us to consider both observed heterogeneity in the demographic and human capital characteristics (x_i) and unobserved heterogeneity (θ_k) of job seekers which are assumed to be independent. Specifically, we can accommodate unobserved heterogeneity in the model by allowing K to be relatively large. We estimated the model using a range of values for K including K=20, K=5, K=3, and K=2 and found that in all cases there was convergence towards a single point of support suggesting that our sample of low-skilled job seekers exhibits very little unobserved heterogeneity in rejected offer arrival rates ($\widetilde{\lambda}_i$).[17] Moreover, we adopted a lognormal distribution (with a

[17] We validated the program by testing it on artificial data where we chose an equal number of observations (persons and months) as in the actual data, and we simulated job-offers given a particular distribution of unobserved heterogeneity. We ran separate simulations for the unobserved heterogeneity with 2 and 5 points of support, all with equal mass-weight, $\delta = 1$, geometrically spaced hazard rates (a factor of 2 between each successive point), and N=1577. There were no convergence problems and the estimates were all within one per

mid-point of θ and a standard deviation of σ_θ) for $\widetilde{\lambda}_i$ In all cases, we found σ_θ converged to 0, again indicating a lack of unobserved heterogeneity.[18] Consequently, we use a proportional hazard model to estimate equation (2) using information on rejected wage offers for the sample of individuals observed to have at least one spell of employed job search within our data window. The results (coefficients and t-statistics) are presented in the first column of Table 3.

Table 3: Proportional Hazard Estimation Results for Job-offer Arrival Rates G($\widetilde{\lambda}_i$), and Relative Search Intensity δ

Observed in unemployment and employment			All job seekers all periods			
	rejected job offers		rejected job offers only		All job offers	
Variables	coef.	t-val	coef.	t-val	coef.	t-val
ln(constant)	-2.37	25.8	-2.331	29.9	-1.798	34.4
Part-time study	0.011	0.1	0.016	0.6	0.008	0.5
Number of kids	-0.006	0.2	-0.017	0.8	-0.031	2.0
Having a disability	-0.033	1.3	-0.028	1.3	-0.039	2.6
Presence of partner	0.010	0.3	0.025	1.1	0.018	1.1
Age at start of the sample	-0.104	3.9	-0.097	4.4	-0.089	5.9
Living outside a city	-0.054	2.1	-0.053	2.5	-0.024	1.7
δ	0.811	3.2*	0.854	2.9*	0.663	10.5*
N	1247		1577		2314	
Average Likelihood	-5.85276		-6.25752		-7.87193	

*The t-value on δ refers to the H_0 of $\delta = 1$.

What do these results tell us about rejected job-offer arrival rates for employed and unemployed job seekers? First, it is interesting that there is little evidence of heterogeneity in arrival

cent of the actual values.

[18]The lack of unobserved heterogeneity results from a hazard rate of obtaining a (rejected) job-offer that is relatively constant over time. In other words, the data do not suggest that over time the sample of those who have not yet received a wage offer becomes more selective with respect to the individual-specific offer arrival rate. Specifically, the hazard does not decline over time and if anything slightly increases which does not support the presence of unobserved heterogeneity.

rates. In part, this may stem from the fact that our sample includes relatively homogenous job seekers with limited labour market prospects. In fact, the predicted arrival rate of rejected job offers is only once every 15 months, while the arrival rate of accepted job offers is once every 9.5 months.[19]

More importantly, the relative intensity of employed versus unemployed search ($\hat{\delta}$) is estimated to be 0.811 with a 95 per cent confidence interval of [0.685,0.961]. This confidence interval does not quite include 1 indicating that for the low-skilled job seekers in our sample the intensity of job search is lower in employment than in unemployment. Moreover, the results indicate that it is older job seekers and those living outside a city centre who are significantly less like to get (rejected) job offers.

These estimates based on rejected wage offers have the advantage that – if rejection rates are exogenous and do not depend on employment state – we can deal with any unobserved heterogeneity by restricting the sample to those individuals observed both in employed and unemployed job search, while still recovering unconditional estimates of the offer arrival rate. The difficulty is that the propensity to reject a job offer may in fact depend on whether one is employed or unemployed. To test the robustness of our results to this assumption, we also compare the results from the preferred specification with the results from proportional hazard models when we do not condition on observing at least one employed search spell, and when we use both rejected and accepted job offers (see Table 3 columns 2 and 3). These estimates

[19] Homogeneity in arrival rates also reflects the fact that we focus on self-reported, rejected job offers in a directed search environment. This implies that the results do not include the usual individual-specific heterogeneity in the arrival rate of job offers with an absolute wage w. It is certainly the case that some individuals are more likely to receive a high-wage job offer than are others. However in this framework, reported job offers for different individuals are not constrained to coming from the same wage distribution. Therefore, in this model individual-specific heterogeneity is captured in the disparity in reservation wages.

do not require us to make the strong and possibly invalid assumption that rejection rates are not dependent on employment status.

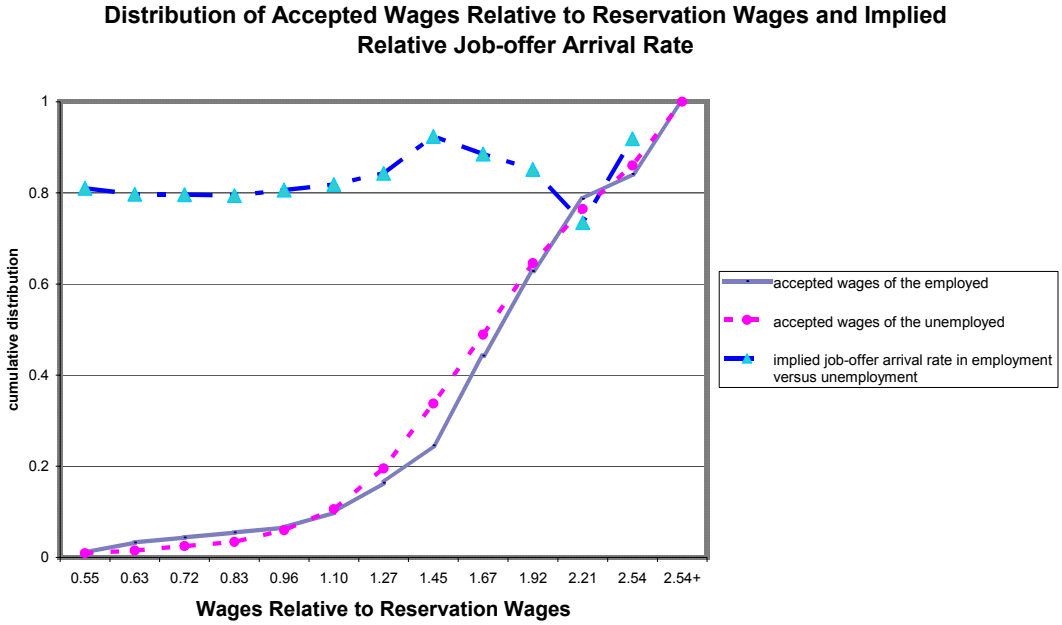
The relative intensity of employed versus unemployed search ($\hat{\delta}$) is estimated to be 0.663 when we use information about all job offers indicating that search intensity is significantly lower in employment than in unemployment. This estimate of δ is slightly lower than when we only use rejected job offers which reflects either the fact that the employed are less likely than the unemployed to reject job offers or that there are sample selection effects. The hypothesis that the estimate of the relative search intensity (δ) is the same in both cases cannot be rejected at the 95 per cent confidence interval, however. We also considered whether deleting individuals who never got a job offer (less than 2 per cent of the sample) affected the estimated intensity of employed versus unemployed search and found similar results (the point estimate of δ was 0.855 in that case). Our overall conclusion that the intensity of search for low-skilled job seekers is slightly lower in employment than in unemployment is unaffected by whether we use all wage offers or only rejected wage offers and the sample we choose.

5.2 Job-offer Arrival Rates

These results tell us about the relative effectiveness or intensity of job search by employment status. In order to understand how the frequency of job offers varies with employment status, however, we also need to focus on the nature of the job-offer wage distributions themselves. In Figure 2, the estimated wage distributions $\hat{F}^{E}(\frac{w}{\tilde{w}_i})$ and $\hat{F}^{UN}(\frac{w}{\tilde{w}_i})$ are presented along with the estimated relative arrival rate of jobs that pay at least $\frac{w}{\tilde{w}_i}$ in employment versus unemployment

$(\hat{R}(w))$.[20] The first thing to note is that – although theory predicts that individuals will not

Figure 2: Distribution of Accepted Wages Relative to Reservation Wages and Implied Relative Job-offer Arrival Rate



accept wages lower than their reservation wages – observed wages are higher than reported reservation wages in only 94 per cent of cases. This finding is consistent with other empirical evidence and may indicate the presence of measurement error in actual and/or reservation wages.[21]

Figure 2 also demonstrates that the estimated distributions $\hat{F}^E(\frac{w}{\check{w}_i})$ and $\hat{F}^{UN}(\frac{w}{\check{w}_i})$ are very close. Most importantly, $\hat{F}^E(\frac{w}{\check{w}_i})$ does not stochastically dominate $\hat{F}^{UN}(\frac{w}{\check{w}_i})$, suggesting that

[20] The estimates of $\hat{R}(w)$ are based on our prefered specification in column 1 of Table 3.

[21] Holzer (1987), for example, finds for the US that on average the hourly wages of offers accepted by the employed are less than the average reservation wages amongst those employed individuals with job offers.

low-skilled job seekers are not able to use their employment base to generate more acceptable wage offers. Indeed, only in the region $1.4 < \frac{w}{\breve{w}_i} < 1.6$ are the two distributions significantly different at the 95 per cent confidence level. In that range, offered wages are clearly higher in employment, as might be expected if employment itself offered access to other employment opportunities. Over much of the range, however, there is little difference in the wages offered to employed and unemployed job seekers. In part, this may reflect the fact that many individuals in our sample who search while employed have unattractive or insecure jobs and hence do not necessarily search for higher paying jobs.

Finally, we discuss the point estimates for $R(\frac{w}{\breve{w}_i})$. The most important aspect of this graph is that across most of the relevant wage range, the point estimates of $R(\frac{w}{\breve{w}_i})$ are approximately the same as $\hat{\delta}$ indicating that $(1 - \hat{F}^E(\frac{w}{\breve{w}_i}))/(1 - \hat{F}^{UN}(\frac{w}{\breve{w}_i})) \approx 1$. The standard deviation of $\hat{R}$ is about 0.2 implying that job offers in employment are slightly though not significantly higher than in unemployment. Most importantly, across the entire range of possible values for $\frac{w}{\breve{w}_i}$ it is the case that $\hat{R}(\frac{w}{\breve{w}_i})$ is not significantly different from 1 at the 90 per cent confidence level. Its point estimate for the mid-point of the $\hat{F}^E(\frac{w}{\breve{w}_i})$ distribution (when $\frac{w}{\breve{w}_i} \approx 1.91$) is 0.95 which is very close to 1. Consequently, the overarching conclusion from this analysis is that there is no evidence for differential job-offer probabilities in employment versus unemployment, with the point estimate being a differential of no more than 15 per cent.

5.3 Discussion

In Australia, the probability of receiving a job offer is largely independent of current employment status. Consequently, searching while unemployed does not generate an efficiency gain for the

economy as a whole through a quicker matching of vacancies and job searchers. In this respect the Australian labour market falls between that of Northern Europe, where the unemployed are less likely to obtain job offers than are the employed[22], and the United States where the unemployed seem more able than the employed to search for new jobs.[23]

It is difficult to know whether these disparities in research findings stem from differences in the institutional arrangements for administering unemployment benefits or from the specifics of the data sample, analysis period, and estimation strategy. Results based upon a group of disadvantaged job seekers looking for work in a period of relatively high unemployment may not readily translate to other groups operating under other labour market conditions. At the same time, differences across countries in the relative efficiency of employed versus unemployed search are likely to be due in part to institutional differences. In Australia, unlike many other countries, unemployment benefits are non-contributory, funded from general revenue, and comprise one component of a broader system of income-support payments administered by the Australian government. Payment levels are uniform across the country, do not depend on previous work history, and are not time limited. This stands in sharp contrast to the social insurance model operating in the United States. Moreover the easier dismissal procedures in the United States – which might make employers less reluctant to employ people who are currently unemployed (i.e. employers are more prone to ignore the signalling aspect of unemployment in cases where dismissal is easier) – may also play a role. Finally, it is also possible that there are equilibrium effects driving this difference. In particular, it is possible that to be a (short-term)

[22]Some evidence for this is found by Boeri (1999). He shows that an increase of workers on short-term jobs, who are likely to be on-the-job searchers, reduces the flow from unemployment to employment using information from a number of countries. See also Pissarides and Wadsworth (1994) and Jackman, et al. (1989).

[23]See an overview of a few articles in Devine and Kiefer (1991: pp. 254-255).

unemployed individual searching for a job is not taken to be a bad signal in the United States whereas it is in Australia and Europe.

6 Conclusions

The relationship between current employment status and the efficiency of job search has implications for theoretical models of job search behaviour and for public policies targeting the unemployed. If unemployed search is more effective than employed search, a case can be made that subsidising unemployment may improve labour market efficiency. At the same time, if the employed receive at least as many job offers as the unemployed, then subsidising unemployment may lead to higher unemployment levels and be counterproductive.

We investigated the relative efficiency of employed versus unemployed job search using unique data from a panel survey of low-skilled job seekers in Australia. These individuals are of particular interest because they are often the focus of policies targeted towards the unemployed. Unlike other standard data sets, our data provide information about both accepted and rejected job offers. Using a semi-structural estimation model, we found that job-offer arrival rates in employment and unemployment are not significantly different: our point estimates for the ratio at which job offers attached to a certain wage arrive in employment versus unemployment range from 0.7 to 0.99, which in no case are significantly different from 1.

In this respect, the Australian labour market is like that of Northern Europe where unemployed job search is less or equally efficient, and unlike the United States where there are efficiency gains to searching while unemployed. Unemployment benefits in Australia, therefore, have no effect on the efficiency of job search, but rather serve a redistributive function. This

finding lends empirical support to the Burdett and Mortensen (1998) model and others like it, which allow for employed job search and assume the job-offer arrival rate in employment to be equal to that in unemployment.

References

1. Acemoglu, D., and R. Shimer (1999), 'Efficient Unemployment Insurance', *Journal of Political Economy* 107, pp. 893-928.

2. Australian Bureau of Statistics (ABS) (1997), 'Survey of Employment and Unemployment Patterns; Microdata file on CD-ROM', Information Paper 2/97, ABS: Labour Statistics Branch, Canberra.

3. Australian Bureau of Statistics (ABS) (1998), Australians' Employment and Unemployment Patterns, 1994-1996, ABS Catalogue No. 6289.0.

4. Australian Bureau of Statistics (ABS) (2004) Average Weekly Earnings, Australia. ABS Catalogue number 6302.0, Canberra.

5. Boeri, T. (1999), 'Enforcement of Employment Security Regulations, On-the-Job Search and Unemployment Duration', *European Economic Review,* 43(1), pp. 65-89.

6. Bontemps, C., Robin, J.M., and Van den Berg, G.J. (2000), 'Equilibrium Search with Continuous Productivity Dispersion: Theory and Non-parametric Estimation', *International Economic Review* 41(2), pp. 305-358.

7. Burdett, K. (1979), 'Unemployment Insurance Payments as a Search Subsidy: A Theoretical Analysis', *Economic Inquiry*, 17(3), July 1979, pp. 333-43

8. Burdett, K. and Mortensen, D.T. (1998), 'Wage Differentials, Employer Size and Unemployment', *International Economic Review* 39(3), pp. 257-273.

9. Devine, T.J. and Kiefer, N.M. (1991), *Empirical Labor Economics; The Search Approach*, Oxford University Press, New York.

10. Flinn, C.J. and J.J. Heckman (1982), 'New methods for Analyzing Structural Models of Labor Force Dynamics'. *Journal of Econometrics,* 18, pp. 115–168.

11. Frijters, P., and Van der Klaauw, B. (2001), 'Job Search with Non Participation', *Tinbergen Institute Discussion paper.*

12. Frijters, P. and Kalb, G. (2003), 'Structural Analyses of Duration Dependence and Persistence in Job-Offer Arrival Rates and Wages'. Final report prepared for the Department of Family and Community Services, Canberra.

13. Gregg, P. and Petrongolo, P. (2000), "Random or Non-Random Matching? Implications for the Use of the UV Curve as a Measure of Matching Performance", *Institute for Economics and Statistics* (Oxford), Discussion paper No 13, first version 1997.

14. Holzer, H., (1987), 'Job Search by Employed and Unemployed Youth', *Industrial and Labor Relations Review*, 40(4), pp. 601 - 611.

15. Jackman, R., Layard, R. and Pissarides, C. (1989), 'On Vacancies', *Oxford Bulletin of Economics and Statistics,* 51(4), pp. 377-394.

16. Kahn, L. and Low, S., (1982), 'The Relative Effects of Employed and Unemployed Job Search', *The Review of Economics and Statistics*, 64(2), May, pp. 234-241.

17. Kahn, L. and Low, S., (1984), 'An Empirical Model of Employed Search, Unemployed Search, and Nonsearch', *The Journal of Human Resources*, 19(1), Winter, pp. 104-117.

18. Kahn, L. and Low, S., (1988). 'Systematic and Random Search: A Synthesis', *The Journal of Human Resources*, 23(1), Winter, pp. 1- 20.

19. Kahn, L. and Low, S. (1990), 'The Demand for Labor Market Information', *Economic Journal,* April, 56(4), pp. 1044- 1058

20. Ljungqvist, L. and Sargent, T.J. (1998), 'The European Unemployment Dilemma', *Journal of Political Economy*, 106(3), pp. 514-50.

21. Marimon, R. and Zilibotti, F. (1999), 'Unemployment vs. mismatch of talents: reconsidering unemployment benefits', *Economic Journal,* 109(455), pp. 266-291

22. Pissarides, C.A. and Wadsworth, J. (1994), 'On-the-Job Search; Some Empirical Evidence from Britain', *European Economic Review*, 38(2), pp. 385-401.

23. Van den Berg, G.J. (1990), 'Nonstationarity in Job Search Theory'. *Review of Economic Studies,* 57, pp. 255–277.

24. Van der Klaauw, B., Van Vuuren, A., and Berkhout, P.(2004),"Labor Market Prospects, Search Intensity, and the Transition from College to Work", unpublished working paper, June.

Appendix 1
Results from the Fixed-Effect Reduced Form Estimations

Table A.1 presents the reduced-form, fixed-effect analyses of wages and reservation wages. These first difference models shed light on the variation in wages and reservation wages across time and individual characteristics. Note how the low standard deviation in reservation wage changes (0.039) compares to the much larger standard deviation in the levels of reservation wages (about 0.3), implying that over 90 per cent of the variation in reservation levels is due to constant individual-specific factors.

Table A.1: Fixed-effect Analyses of Starting Wages $\tilde{w}_{it}$ and Reservation Wages $\tilde{\phi}_{it}$ Using the Australian SEUP Data

	$\triangle \ln \tilde{w}_{it}$		$\triangle \ln \tilde{\phi}_{it}$	
Variables	coef.	t-val	coef.	t-val
Individual characteristics:				
intercept	0.022	1.4	-0.011	0.9
$\triangle$t	0.00011	2.8	0.00015	3.8
first employment spell			-0.07	0.6
currently employed			0.035	1.8
current unemployment duration			-0.000023	1.2
cumulative unemployment duration	0.00013	2.5	-0.000011	0.4
current employment duration	0.00007	4.1	0.000035	0.9
(cum. unem.dur.)*(30$\leq$age<40)	-0.00014	3.0	-0.00011	2.1
(cum. unem.dur.)*(40$\leq$age<50)	-0.00015	2.7	-0.000002	0.0
(cum. unem.dur.)*(50$\leq$age<60)	-0.00016	2.2	-0.00012	1.9
$\sigma_{m,\phi}$			0.039	
Number of observations	5267		3713	
Number of individuals	1892		1576	
R^2	0.02		0.02	

The other available time-varying regressors were: previous wage, duration of last employment/unemployment spell, part-time studying, # children, have a partner, disability, hours of work,education levels, and urban housing. The shown specification includes the most relevant and significant variables: none of the other variables added significantly to the explained variance.