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The Impact of Demographic and Individual Heterogeneity on Unemployment Duration: A Regional Study

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Abstract

The differential risk of unemployment across UK regions and population sub-groups is well recognised. The extent to which residential location and individual heterogeneity contribute to the duration of unemployment is, however, difficult to discern. This paper investigates the impact of individual heterogeneity and regional influences on unemployment duration utilising cross-section microeconomic data drawn from a representative random survey of individual job seekers for the English County of Kent. These individual-level data are unique in that they provide information concerning the personal characteristics of job seekers, alongside direct observations of both their reservation wages and job search behaviour. Such data are extremely rare and, to our knowledge, have never before been utilised in a regional context. Thus, the paper contributes to the empirical literature by analysing the extent to which individual heterogeneity and intra-regional variation in labour market opportunities impact upon the observed distribution of unemployment duration(s). This is an important issue for policy formation. Evidence of regional influences advocates a more active role for macroeconomic demand-led management and lends support to a more integrated strategy for the implementation of urban and regional policy in a climate where welfare to work schemes dominate attempts at increasing the employability of the unemployed.

I. Introduction

Headline unemployment currently stands at one of its lowest rates in over two decades. Since 1992, claimant unemployment has fallen by almost 1½ million and on the ILO definition by nearly 1 million. Despite this fall, change to the headline rate of unemployment masks a far more complex pattern of UK unemployment. For many individuals unemployment is a short-lived affair. For others, the risk of repeated or prolonged periods of unemployment is high.[1] Repeated or prolonged unemployment spells may reflect occupational choice or poor employability brought about by poor skills and/or repeated labour market exclusion. They may also reflect a lack of employment opportunities concentrated in specific geographical areas. Both facets amount to a significant detachment from work. They also contribute to growth in the level of non-working households and low pay.[2] These trends invariably underlie part of the observed deterioration in measures of relative poverty and income mobility over the last twenty years (Blanden *et al*, 2002). They also yield significant implications for the governement's current policies concerned with social inclusion and the development of flexible labour markets. They are also relevant to the persistent unemployment problem in many European labour markets.

The Theory of Job Search provides the theoretical basis for the analysis of labour market transitions via the process of worker separations. The timing of these separations also provides the conceptual framework for the analysis of unemployment spell lengths. The preference to analyse the duration aspect of unemployment is derived from considerations regarding economic welfare.[3] The frequency and average duration of unemployment reveal important information on the dispersion of unemployment across individuals. This information has significant policy implications. Increased duration of unemployment erodes individual incomes, depreciates human capital, and increases the inequality of employment opportunities and income distribution. The potential impact on economic development is great. Failure to tackle persistent unemployment significantly reduces the value of current and future output and results in misery for those concerned.[4]

Search theory emphasises flows into and out of unemployment, rather than the level of unemployment at any one time. The equilibrium or 'natural' rate of unemployment is asserted to be unaffected by the distribution of workers across labour market states or

the distribution in any period. Consequently, the theory focuses on the outflow rate from unemployment and interprets this as being equivalent to the probability that an unemployed individual finds work. In a steady-state, such analysis permits the unemployment rate to be expressed as the inflow into unemployment multiplied by the average time spent there (average duration is defined as the inverse of the outflow rate).[5] This link is of critical importance. Firstly, it provides a suggestive framework where aggregate unemployment may be investigated.[6] Secondly, it provides a method of identifying groups of workers with potentially low re-employment probabilities and, thus, those who are most likely to be at risk of long-term unemployment. Identifying the relative importance of workers' characteristics may enable the formulation of policy that alters the pattern of flows among such groups. This, in turn, should yield desired alterations both to the incidence and experience of unemployment at both the national and regional level.

The differential risk of unemployment across UK regions and population sub-groups is well recognised. However, the extent to which residential location and individual heterogeneity contribute to the probability of exit from unemployment is more difficult to discern. Unemployment amongst men is consistently higher than it is amongst women. It is also higher for those groups of workers who are young, non-white, have no qualifications or operate in semi- or unskilled occupations (Jackman & Roper, 1987; Nickell, 1999). The prevalence of regional disparities in the incidence of unemployment is equally marked. In the Summer of 2002, the seasonally adjusted ILO measure of unemployment ranged from 3.8% in the South-East to 6.3% in the North-East. The variation in regional disparities at lower spatial units is even greater.[7] This variance in relative unemployment rates could reflect compositional effects brought about by the unequal distribution of population sub-groups. Brown & Sessions (1997) contest this view. They reveal that regional disparities in the risk of unemployment are prevalent even after controlling for a wide range of demographic characteristics. Associated economic implications are considerable. Regional disparities reduce output and raise inflationary pressure. They also constrain opportunities for unemployed workers in depressed areas and impose significant negative welfare effects where selective out-migration of highly skilled workers causes low rates of economic activity to persist.

Extremely few studies analyse UK unemployment duration(s) within a region. Blackaby & Manning (1990a, 1990b, 1992) analyse the duration of regional unemployment to investigate the determination of regional earnings differentials. Jones & Manning (1992) utilise regional data to consider the role of the long-term unemployed in identifying hysteresis in the unemployment-vacancy relationship. Brown & Sessions (1997) explore the relative effects of demographic and regional influences utilising a profile of UK unemployment. They indicate that regional location is significantly correlated with unemployment, even when individual characteristics of the unemployed are taken into account. This relationship is even more significant for the long-term unemployed. Warren (1997) provides further credence here. Utilising a sample of long-term unemployed males, he reveals regional factors affecting the arrival rate of job offers to be again significant when controlling for an array of personal characteristics. There is also little evidence to suggest a role for self-limiting behaviour.[8]

This paper investigates the impact of individual heterogeneity and regional influences on unemployment duration utilising cross-section microeconomic data drawn from a representative random survey of individual job seekers for the English County of Kent. These individual-level data are unique in that they provide information concerning the personal characteristics of job seekers, alongside direct observations of both their reservation wages and job search behaviour.[9] The availability of such data is rare. Hence, this paper contributes to the empirical literature by analysing the extent to which individual heterogeneity and intra-regional variation in labour market opportunities impact upon the observed distribution of unemployment duration(s). In particular, the paper analyses the extent to which the duration of unemployment is determined by individual choice. This is an important issue for the formation and evaluation of policy. If individual choice is found to significantly influence the conditional probability of exit from unemployment then the efficacy of current microeconomic supply–side initiatives such as 'The New Deal' and other welfare to work policies is supported. The existence of regional influences, by contrast, advocates a more active role for macroeconomic demand-led management. It also supports a more integrated strategy for the implementation of urban and regional policy such as the recent creation of Frameworks for Regional Employment and Skills Action (FRESAs).[10]

The remainder of the paper is organised as follows. The next Section presents a brief overview of Job Search Theory and its relevance to the analysis of unemployment spell lengths. Section 3 describes the data extensively. Section 4 formulates an empirical model of unemployment duration tied closely to the theory of job search. Section 5 outlines the methodology utilised in the estimation of the empirical model. Empirical results and discussion are reported in Section 6. Section 7 summarises and concludes.

II. The Job Search Approach: A Brief Overview

Job search theory asserts that the transition or exit probability out of unemployment depends on two factors: Firstly, the probability that the worker receives a job offer; and secondly, the probability that the job offer is acceptable. An acceptable job offer is a random offer drawn from the wage distribution that exceeds the worker's reservation or minimum acceptance wage, that is, the wage that makes the individual indifferent to being employed or unemployed. In a stationary framework, this wage is constant and inversely related to search and opportunity costs. A job that offers a wage higher than the reservation wage is thus an acceptable wage and provides an optimal route into employment.[11]

The empirical literature on unemployment duration is vast and encompasses a variety of themes. Most of these studies utilise the 'hazard' approach to the analysis of unemployment and use individual data to estimate models that specify the conditional probability of exiting unemployment for a completed unemployment spell rather than focus on those determinants that directly affect the unemployment spell itself.[12] Modelling the hazard or 'exit' rate provides indirect information regarding the determinants of unemployment duration. The probability that a worker receives a job offer is determined by personal and demographic characteristics. It is also dependent on prevailing labour market conditions. These factors influence similarly whether a job offer is acceptable. Personal characteristics such as age, gender, human capital and household composition play a vital role in determining individual preferences and hence, the formulation of an appropriate reservation wage. They are also likely to underpin an individual's job search behaviour and related efforts to find employment in surrounding local labour markets.

Many studies evaluate the impact of the level and duration of unemployment benefit on unemployment duration (Atkinson *et al*, 1984; Narendranathan *et al*, 1985; Arulampalam & Stewart, 1995). Several studies extend this analysis to consider the impact of unemployment benefit receipt on job search behaviour (Wadsworth, 1991; Schmidt & Wadsworth, 1993) and the impact of targeted assistance schemes (Dolton & O'Neill, 1996). Theoretical models of job search assert that unemployment benefits lower the costs of search thereby raising individual reservation wages and the length of an unemployment spell. A small positive benefit effect on unemployment duration is commonly agreed upon.[13] However, this effect is sensitive to personal and demographic characteristics, elapsed duration, and prevailing labour market conditions. Narendranathan & Stewart (1993a) suggest that the benefit effect declines with unemployment spell length. By contrast, Meyer (1990) observes the hazard rate to rise prior to the expiration of unemployment benefit receipt. The evidence for a potential benefit effect on job search behaviour is also mixed. Wadsworth (1991) reports a statistically significant positive effect on search effort, that is, benefit claimants search more extensively than non-claimants. Schmitt & Wadsworth (1993), by contrast, reveal the level of benefits to exert no such impact.[14]

Sensitivity of the hazard to data stratification and sample selection suggest that the role of individual heterogeneity in the determination of unemployment spell lengths may be substantial.[15] Identifying the 'true' impact of individual heterogeneity is crucial to understanding both the characteristics of the long-term unemployed and the time dependency of the exit probability out of unemployment. Several empirical studies reveal the probability of exit from unemployment to increase with elapsed duration, that is, they reveal positive state dependence (Moffit, 1985; Meyer, 1990).[16] However, many studies reveal strong negative state dependence (Nickell, 1979; Atkinson *et al*, 1984; van der Berg & van Ours, 1994). Both genuine state dependence and individual heterogeneity can explain this observed decrease in the exit probability from unemployment. However, the presence of unmeasured or unobserved individual heterogeneity will bias estimates of the exit probability toward *spurious* negative state dependence. Intuitively, this arises if some unobserved characteristics intensify the transition of workers into re-employment. In this instance, individuals with higher re-employment probabilities leave the sample first leaving behind those individuals who do not possess those unobserved characteristics. Over time, these less employable

individuals will come to dominate the sample, thus inducing a systematic bias toward stronger negative state dependence than actually exists.

Distinguishing between 'pure' and 'spurious' state dependence has important implications for policy. The former implies that policies should be concerned with minimising unemployment durations across all sub-groups of workers.[17] The latter implies that policies should be targeted at those sub-groups who are disproportionately predisposed to longer durations. Recent studies utilising 'flexible' econometric specifications of the underlying exit rate from unemployment typically mitigate the role of unobserved heterogeneity in state dependence (Han & Hausman, 1990; Narendranathan & Stewart, 1993b). Nevertheless, observed and unobserved individual heterogeneity remains crucial to the unemployment process.

Jones (1988) and van der Berg (1990) reveal individual heterogeneity and variation in the arrival rate of offers to be at least as important as the reservation wage in determining unemployment duration. Labour market conditions and individuals' method(s) (and intensity) of job search are undoubtedly important here. It is acknowledged that the incidence and duration of unemployment are not uniformly distributed across geographical areas of the economy. The arrival rate of job offers depends on prevailing demand conditions in the labour market. Areas where the demand for labour is expanding will experience an increasing set of job opportunities, thereby exerting a positive effect on the arrival rate of offers. Lack of job opportunities in other areas has the converse effect. Of course, unemployment durations will also be dependent on individuals' personal and demographic characteristics, their attractiveness to employers and *vice versa*. Lifetime employment histories, age, educational attainment and job search behaviour are important in this regard. Assessing the relative importance of such characteristics is essential, however, to gauging the impact of geographical variation in the arrival rate of offers. This, in turn, is crucial to understanding the role of 'choice or chance' in unemployment duration.[18]

Recent studies reveal that job search behaviour exhibits strong variation across individuals in similar socio-economic groups. The lack of an obvious explanation as to why similar individuals adopt differential search strategies may indicate that the choice of strategy be utilised empirically to proxy for the potential effects of unobserved

individual heterogeneity. This assumption suggests that individuals utilise alternative methods to signal their potential productivity relative to similarly skilled workers. Atkinson *et al* (1996) and Alpin & Shackleton (1997) report a large number of the *employed* to obtain their jobs using informal search methods.[19] By contrast, Urwin & Shackleton (1999) report the use of informal search methods by the *unemployed* to have a significant negative effect on the probability of exit from unemployment. These results suggest a differential role for job search methods across alternative labour market states. They also indicate distinct differences in the behaviour of individuals engaged in on- and off-the-job search.

The effect that increased job search has on the exit probability from unemployment is potentially ambiguous. Increased search activity should result in an increase in the arrival rate of offers and hence a positive effect on the exit probability. However, a negative effect may also be observed.[20] Such ambiguity raises concern over the appropriate sign to expect on variables included in a reduced form econometric specification. Direct evidence on offer arrival rates is limited. However, there is considerable evidence to suggest that the unemployed reject very few job offers (Jones, 1989; Holzer, 1988; van der Berg, 1990; Erens and Hedges, 1990).[21] Variation in acceptance probabilities also appears to be small (Wolpin, 1987). These results indicate that variation in the arrival rate of offers may be the major determinant of variation in unemployment durations. Gorter & Gorter (1993) support this result. They conclude that neither the level of unemployment benefit nor individuals' reservation wages are important in ending a spell of unemployment. Instead, the offer arrival rate and those factors deemed to influence it provide the dominant means of escape.

This paper explicitly addresses the impact of individual heterogeneity and regional influences on the duration of unemployment. We utilise cross-section data drawn from a regional survey of the stock of individual job seekers in the County of Kent at October 1992. The dataset provides a rich source of information concerning personal and demographic factors along with individuals' reservation wages and job search behaviour. The quality of this data permits us to investigate the extent to which unemployment duration is determined by individual choice. It also provides an insight into the role of geographical influences. Unfortunately, data limitations prevent an analysis of the issue of state dependence. Nonetheless, our results provide new insights

into the unemployment process and current policies aimed at increasing the employability of the unemployed.

III. Data

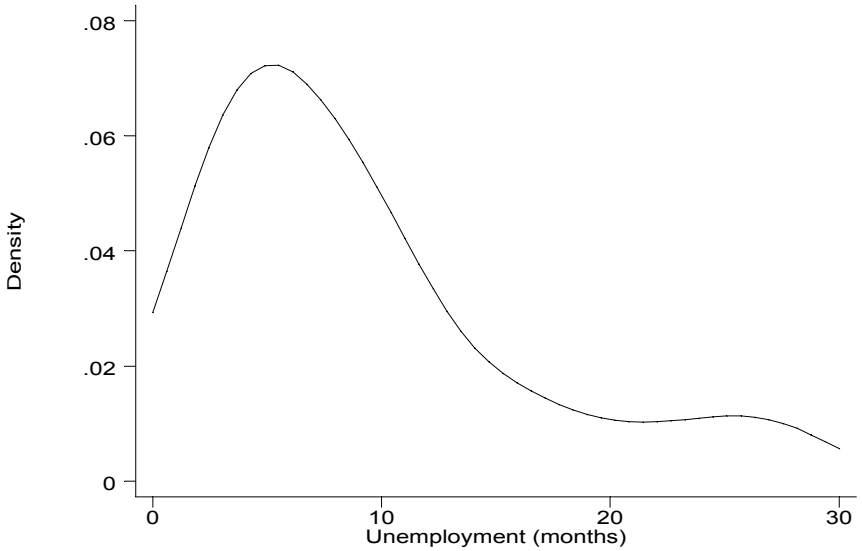
We estimate individuals' unemployment durations utilising cross-section microeconomic data drawn from a representative random survey of 5,392 interviews taken from Kent Employment Service records at October 1992. The survey accords well with Department of Employment records, accounting for 8 per cent of the unemployed in Kent at that time. Sample members were collated by drawing on a proportionately stratified sample of the unemployed by district. For each district, this sampling strategy ensures that the same proportions of persons are represented in the survey as for NOMIS.[22] Equally, it ensures that the distribution of unemployment be representative by age, gender and elapsed duration.[23]

We restrict analysis to those individuals in the survey who provide valid responses to those questions utilised in an econometric model that appears well informed by job search theory.[24,25] In addition, to alleviate potential biases in the reservation wage data, we symmetrically trim the data and omit the 0.5 per cent of those individuals with both the highest and lowest reservation wages. These restrictions result in a final sample of 4,872 individuals. Tables A1 to A3 of the Appendix report the distribution of unemployment duration for this sample by age, educational attainment and district. Table A4 presents data definitions and summary statistics.

The duration of unemployment is measured in interval form as months of registered unemployment. Figure 1 plots the distribution of unemployment durations. The distribution is positively skewed with 56 per cent of the sample having unemployment duration of less than six months, and 7 per cent having duration in excess of two years.[26] Table 1 reports the duration of unemployment by gender. This reveals that gender is important: men appear to be at greater risk of long-term unemployment. The proportion of women who are long-term unemployed (> 1year) is a little under 14 per cent. This contrasts with 23 per cent of men. This pattern of unemployment may reflect a greater probability of exit to non-participation for women. Thus, competing risks in the analysis of unemployment is clearly inferred.

Figure 1

The Distribution of Unemployment Duration



The survey provides a rich source of demographic and personal information. Individual attributes available in the data include gender, marital status, educational attainment and previous occupation. Additional information regarding age, health, literacy and labour market mobility is also included. Educational attainment, age and previous occupation are important considerations in the analysis of unemployment. Younger workers typically face a higher incidence of unemployment than older workers. Their durations are, however, on average much shorter. Similarly, individuals with few or no qualifications are likely to experience longer durations of unemployment, as are those individuals who were previously employed in industries experiencing sectoral decline. Marital status and gender are important because of the strong link with labour force participation and family dependency. Increased dependency should exert a negative effect on unemployment duration. For men, this is likely to result in the transition to employment. For women, however, there is an increased likelihood of exit to non-participation.[27]

Table 1

Unemployment Duration by Gender

	Male		Female		Total	
Duration Unemployed (months)	Persons	%	Persons	%	Persons	%
0-3	1,074	29.0	411	35.0	1,485	30.5
3-6	920	24.9	312	26.5	1,232	25.3
6-12	868	23.5	294	25.0	1,162	23.8
12-18	348	9.4	76	6.5	424	8.7
18-24	198	5.4	40	3.4	238	4.9
24+	289	7.8	42	3.6	331	6.8
Total	3,697	100	1,175	100	4,872	100

Individual exit rates are also likely to be influenced by labour market mobility. The greater the distance and prospective travel time an individual is willing to consider, the greater is the perceived wage offer distribution and the probability that an acceptable job offer arrives. Data mining reveals that labour market mobility has a significant impact on the distribution of unemployment duration. Gender effects are also important here. The data reveals that 53 per cent of women are prepared to commute up to half an hour; 17 per cent are prepared to commute for an hour or more. This contrasts with 26 per cent and 40 per cent of men respectively.[28] Access to one's own transport is equally important. Seventy-five per cent of individuals with their own transport have experienced unemployment spells of less than 6 months, whilst 95 per cent have been unemployed for less than 1 year. This contrasts with 44 per cent and 70 per cent respectively for those without such transport.

Reservation wages are derived from responses regarding the minimum weekly wage unemployed individuals would be prepared to accept in order to gain employment. Job search theory posits that the reservation wage should be less than or equal to the worker's acceptance wage and more than the individual's benefit entitlement. Lack of benefit data prevents this analysis. Reported reservation wages may, however, be tested using previous wages. This reveals that 72 per cent of unemployed respondents report a reservation wage less than or equal to their previous wage. This statistic appears meaningful given that the majority of worker separations occur as an exogenous process (i.e. they do not leave their jobs voluntarily). There is, however, significant variation by age and gender. Reservation wages increase with age. They are also markedly higher for

men perhaps reflecting the importance of industry and occupation structure (the mean reservation wage for men is £192 per week; for women it is £134).[29]

Table 2 reports individuals' job search behaviour and unemployment duration. This reveals that 72 per cent of individuals utilise Job Centres as the main method of search activity.[30] Newspapers and journals account for 18 per cent, 7 per cent is attributed to speculative inquiries, and the remaining 3 per cent to private employment agencies and other methods. The proportion of individuals using speculative inquiries is relatively constant across the duration of unemployment. The use of newspapers/journals and private employment agencies are, however, dominated by the short-term unemployed. This disparity is further demonstrated by the reported use of Job Centres. Seventy-eight (78) per cent of those unemployed for between 12 and 24 months report Job Centres as their preferred method of search. This rises to 84 per cent for those unemployed in excess of 2 years. This pattern could indicate a discouraged worker effect. However, it may indicate the relative success of alternative search methods in exiting unemployment.

Table 2

Unemployment Duration and Search Activity

Duration Unemployed (months)	Job Centre	Newspaper	Private Agency	Speculative Inquiry	Other	Total
0-3	1,036	284	40	110	15	1,485
3-6	882	237	15	85	13	1,232
6-12	828	223	25	81	5	1,162
12-18	335	68	5	15	1	424
18-24	187	35	2	14	0	238
24+	279	32	1	18	1	331
Total	3,547	879	88	323	35	4,872

Finally, geographical variation in job offer arrival rates is captured by a set of district dummy variables.[31] These help to capture those effects brought about by institutional and industrial differences that are inherent in determining the occupational structure of a region and local labour demand. They also help to capture the spatial impact of commuting opportunities and distance effects brought about by close proximity to the major metropolitan area of London. The data reveals significant variation in the incidence and duration of unemployment across the county. Unemployment is concentrated in East and North Kent. Together, these districts account for 81 per cent of

the unemployed. They also account for a high proportion of the county's long-term unemployment problem though the distribution is more mixed with the East Kent districts of Canterbury and Thanet having the highest and lowest proportion of persons long-term unemployed (66% and 19% respectively). Identifying such geographical variation is important and should help to capture variation in the arrival rate of job offers. This, in turn, is crucial to determining appropriate economic policy.

IV. The Empirical Model

The standard job search model implies that both the reservation wage and hazard rate out of unemployment should remain constant over the length of an unemployment spell. The hazard or instantaneous probability of exiting unemployment is equal to the probability that a job offer is received, and the conditional probability that the offer is accepted by the unemployed individual. An acceptable offer is an offer whose wage is greater than the individual's reservation wage.[32]

The hazard rate may be formally derived as:

$$\tau = \delta\pi(1 - F(w^r)) \tag{1}$$

where τ is the hazard rate, δ is the job offer arrival rate, w^r is the reservation wage and $F(w)$ is the cumulative distribution of wage offers. If the hazard rate (τ) is independent of elapsed duration, the implied distribution of completed unemployment spells T, will be exponential:

$$g(T) = \tau e^{-\tau T} \tag{2}$$

The data described in the previous section contains cross-section information for a stock of currently unemployed individuals. Thus, we are interested in the distribution of incomplete spells of unemployment rather than completed spells. The probability of observing an individual's incomplete spell of length t, is the probability of a spell lasting t. This probability is given by the survivor function:

$$S(t) = 1 - G(t) = e\{-\tau t\} \tag{3}$$

where G(t) is the cumulative distribution function for the density function g(t):

$$g(t) = \tau e(-\tau t) \tag{4}$$

The distribution of incomplete spells for an individual will be the normalised survivor function:

$$p(t) = \frac{1 - G(t)}{\int_0^{\infty} (1 - G(s))ds} \tag{5}$$

Integrating equation (2) over T to obtain G(t) and substituting into equation (5), the normalised survivor function may also be written:

$$p(t) = \tau e^{-\tau t} \tag{6}$$

Progression from equation (6) to an estimable model necessitates that additional structure be imposed. Firstly, an assumption must be made regarding the wage offer distribution. The most common and tractable assumption in this regard is that wage offers are drawn from a Pareto distribution. In this instance, the probability that a wage offer is acceptable and exceeds the reservation wage may be expressed as:

$$1 - F(wr) = (A \mid w^r)^{\alpha} \tag{7}$$

$$\Rightarrow \tau = \delta(A \mid w^r)^{\alpha}$$

where A is the origin of the Pareto distribution and α is a scale parameter that may be interpreted as the constant elasticity of the hazard with respect to the reservation wage. Secondly, an assumption must be made regarding the functional form of the probability of receiving and accepting a job not accounted for by the reservation wage. For simplicity, an exponential function of the individual's characteristics, X_i is assumed:

$$\delta A^{\alpha} = e(k + X_i'\beta + u_i) \tag{8}$$

where k is a constant, X_i a vector of non-stochastic regressors, β a vector of unknown parameters, and u_i an independently identically normally distributed random variable with zero mean and variance σ^2. Sections II and III outlined the types of explanatory variables that X_i may represent. These are included to capture the effect of variation in the arrival rate of offers and the acceptance of such offers.

The expected log of incomplete unemployment duration ignoring variation in individuals can be expressed as:

$$E(\log t \mid \tau) = \int_0^\infty \log(s)p(s)ds \tag{9}$$

$$= \int_0^\infty \log(s)\tau e^{-\tau s}ds$$

$$= -c - \log(\tau)$$

where c is Euler's constant. The expected log of incomplete unemployment duration conditional on individual characteristics may thus be written:

$$E(\log t \mid w^r, X_i) = -(c+k) + \alpha \log(w^r) - X_i'\beta - E(u_i \mid w^r, X_i) \tag{10}$$

Renewal theory asserts that, if the flow into unemployment is constant over time, equation (10) may be treated as a regression model where the individuals used for estimation are a cross-section of unemployed people with incomplete durations at a particular point in time.[33] If the above assumptions are acceptable, the parameters of this model can be traced directly to job search theory and the model can be considered a structural model. If the assumptions are not acceptable, then equation (10) provides a valid reduced form regression from which the theory of job search provides guidance as to the types of explanatory variables to include.

Endogeneity is of some concern in the above analysis. The structural interpretation of equation (10) holds only if the conditional expectation of the error term in equation (10) is zero. If reservation wages are correlated with omitted variables, the conditional expectation of the error term will be non-zero. In this instance, the use of instrumental variables (IV) will be necessary to avoid potential simultaneity bias and ensure that parameter estimates are consistent. The choice of instruments used to obtain predicted values of the reservation wage must be restricted to variables that affect the reservation wage and are correlated with, but do not affect, the arrival rate of job offers and the wage offer distribution. Gorter and Gorter (1993), and Jones (1989), utilise the level of unemployment benefits as an appropriate instrument. Information concerning benefit eligibility and benefit levels is not available in our data. Hence, we utilise individuals' last reported wages and whether they were previously self-employed. These instruments

should exert significant impacts on individual reservation wages but are unlikely to yield significant effects on the arrival rate of offers or the wage offer distribution.[34]

V. Methodology

Interval data presents a problem when utilised as a dependent variable in the estimation of an econometric model. Assigning the midpoint to observations in any given group may provide one method of undertaking. Assigning values to open-ended groups is, however, an *ad hoc* process that additionally fails to produce consistent parameter estimates. We overcome this problem by adopting the approach of Stewart (1983) which recognises that the upper and lower bounds of observed intervals provide important information for the consistent estimation of an econometric model.

The latent structure of equation (10) is given by:

$$y_i = X_i'\beta + u_i \qquad i = 1, \ldots, n \qquad (11)$$

where y_i is the unobserved dependent variable (log of unemployment duration), X_i a vector of non-stochastic regressors and β a vector of unknown parameters. The u_i are assumed to be independently identically normally distributed random variables with zero mean and variance σ^2. This yields the distribution of the unobserved dependent variable as:

$$y_i \sim N(X_i'\beta, \sigma^2) \qquad (i = 1, ..., n) \qquad (12)$$

The observed information concerning the dependent variable is that it falls into a certain range on the real line. Let A_k be the upper boundary of the k^{th} range. Then, the information on the log of unemployment duration is:

$$A_{k-1} < y_i \leq A_k \qquad (13)$$

The lower bound of unemployment duration is closed at zero but the upper bound is open ended. Thus, in logarithmic form, both end ranges are open-ended such that $A_0 = -\infty$ and $A_k = +\infty$ where K is the number of groups.

The log likelihood of the above model is given by:

$$\log L = \sum_{k=1}^{K} \sum_{i \in k} \log \left\{ F\left[\left(\frac{A_k - X_i'\beta}{\sigma} \right) \right] - F\left[\left(\frac{A_{k-1} - X_i'\beta}{\sigma} \right) \right] \right\} \qquad (14)$$

$$= \sum_i \log \{F_k - F_{k-1}\}$$

where F is the cumulative distribution of the standard normal. Consistent estimates of β and σ are obtained by Maximum Likelihood Estimation (MLE).

VI. Empirical Findings

Maximum likelihood estimates for the log of unemployment duration are reported in Table 4. Column 1 presents the parameter estimates for the log of unemployment duration when the regression equation is interpreted as a structural model of job search theory. By contrast, the remaining columns present parameter estimates consistent with the reduced form interpretation of the econometric model. Column 2 reports the first stage of the IV procedure and presents estimates of the log of the reservation wage when explanatory variables and instruments are utilised in the estimation. Second stage estimates for the log of unemployment duration are reported in Column 3.

Column 2 reveals that parameter estimates for the log reservation wage equation appear to be both meaningful and appropriate in that they are consistent with what would be expected *a priori*. Reservation wages are significantly greater for older workers, married workers and workers with qualifications or previously employed in professional occupations. They are also greater for those with their own transport and those prepared to travel for longer. Workers who are prepared to travel for between 30 and 60 minutes have reservations wages 9 to 10 per cent higher than the reference category. This rises to 16% for those willing to travel for one hour or more. The reservation wages of women are 11 per cent lower than those for men.[35] This is consistent with the pattern of reservation wages described in Section III. It is also consistent with the observed gender wage gap differential reported in the empirical literature of wage determination.

Table 4

Estimation Results for Full Sample

	MLE		Instrumental Variables: First Stage		Instrumental Variables: Second Stage	
Dependent Variable	Log Duration		Log w^r		Log Duration	
Personal Characteristics						
Age 16-19	-0.314	(5.29)†	-0.066	(4.16)†	-0.337	(5.45)†
30-39	0.121	(2.97)†	0.063	(5.79)†	0.133	(3.18)†
40-49	0.181	(3.97)†	0.075	(6.16)†	0.194	(4.16)†
50+	0.123	(2.46)**	0.031	(2.34)†	0.131	(2.61)†
Gender	-0.208	(5.28)†	-0.118	(11.33)†	-0.235	(5.29)†
Married or Living as a Couple	0.010	(0.27)	0.087	(8.97)†	0.027	(0.70)
Separated, Divorced or Widowed	0.001	(0.01)	0.033	(2.53)**	0.009	(0.18)
Health Problem	-0.038	(0.76)	-0.014	(1.04)	-0.044	(0.87)
Literacy Problem	0.026	(0.30)	-0.005	(0.20)	0.016	(0.19)
Have Own Transport	-0.653	(20.91)†	0.023	(2.82)†	-0.647	(20.56)†
Want to Work Part-time	-0.070	(0.46)	-0.201	(4.98)†	-0.106	(0.68)
Educational Attainment						
First or Higher Degree, HND or HNC	-0.076	(1.05)	0.046	(2.35)**	-0.067	(0.92)
GCE A-level	-0.048	(0.72)	0.041	(2.33)**	-0.042	(0.63)
City & Guilds	-0.086	(1.82)*	0.027	(2.12)**	-0.079	(1.67)*
GCE O-level or Equivalent	-0.153	(3.97)†	0.022	(2.14)**	-0.150	(3.86)†
NVQ	-0.261	(2.23)**	0.069	(2.19)**	-0.247	(2.09)**
Other Qualification	0.040	(0.61)	0.031	(1.76)*	0.046	(0.69)
Search Activity						
Newspapers & Journals	-0.020	(0.51)	0.075	(7.31)†	-0.006	(0.14)
Private Employment Agency	-0.018	(0.16)	0.125	(4.39)†	0.008	(0.07)
Speculative Inquiry	-0.022	(0.37)	0.078	(4.98)†	-0.008	(0.13)
Other	-0.407	(2.37)**	0.045	(1.02)	-0.398	(2.32)**
Travel Time (minutes)						
15-29	-0.151	(2.72)†	0.039	(2.64)†	-0.144	(2.60)†
30-44	-0.094	(1.60)	0.092	(5.82)†	-0.079	(1.32)
45-60	-0.097	(1.57)	0.083	(5.04)†	-0.081	(1.30)
60+	-0.181	(3.10)†	0.151	(9.61)†	-0.153	(2.46)**
Previous Job						
Managers and Administrators	-0.032	(0.49)	0.020	(1.12)	-0.023	(0.35)
Professional Occupations	-0.060	(0.64)	0.002	(0.07)	-0.058	(0.62)
Associate Professionals and Technical	-0.114	(1.47)	-0.002	(0.11)	-0.113	(1.46)
Clerical and Secretarial	-0.114	(1.95)**	-0.079	(5.05)†	-0.127	(2.15)**
Personal and Protective Services	-0.082	(1.32)	-0.103	(6.21)†	-0.106	(1.64)*
Sales	-0.184	(3.09)†	-0.071	(4.46)†	-0.205	(3.33)†
Plant and Machine Operatives	0.106	(2.05)**	-0.058	(4.10)†	0.094	(1.79)*
Other Occupations	0.030	(0.65)	-0.070	(5.66)†	0.014	(0.30)
No Previous Job	0.090	(1.31)	-0.143	(7.80)†	0.071	(1.02)
District						
Ashford	0.164	(2.22)**	-0.012	(0.60)	0.164	(2.22)**
Canterbury	0.450	(6.70)†	-0.039	(2.14)**	0.442	(6.55)†
Dartford	0.158	(2.23)**	0.055	(2.91)†	0.168	(2.35)**
Dover	-0.543	(7.59)†	-0.033	(1.78)*	-0.549	(7.65)†
Gillingham	0.261	(3.78)†	0.011	(0.57)	0.265	(3.82)†
Gravesham	-0.285	(3.38)†	0.042	(1.92)*	-0.277	(3.28)†
Rochester	0.097	(1.50)	0.053	(3.06)†	0.107	(1.64)*
Sevenoaks	-0.207	(1.67)*	0.047	(1.44)	-0.200	(1.61)
Shepway	0.101	(1.45)	0.001	(0.05)	0.103	(1.48)
Swale	-0.058	(0.84)	0.001	(0.06)	-0.058	(0.85)
Thanet	-0.382	(5.67)†	-0.091	(5.10)†	-0.400	(5.82)†
Tonbridge & Malling	0.057	(0.85)	0.003	(0.16)	0.060	(0.90)
Tunbridge Wells	-0.008	(0.06)	-0.013	(0.31)	-0.007	(0.05)

Table 4 Continued

	Structural MLE	Instrumental Variables First Stage	Instrumental Variables Second Stage
Dependent Variable	Log Duration	Log w^r	Log Duration
Log Reservation Wage (w^r)	-0.061 (1.26)	-	-0.187 (1.75)*
Instruments			
Previously Self-employed	-	0.059 (5.63)†	-
Log Previous Wage	-	0.300 (34.31)†	-
Constant	2.418 (9.64)†	3.418 (70.06)†	3.040 (5.73)†
Diagnostics			
F	-	132.48 [0.00]	-
LR χ^2	1156.77	-	1158.27
R^2	-	0.5738	-
Log Likelihood	-7191.5637	-	-7190.8152
N	4,872	4,872	4,872

Notes
1. Estimations by Intercooled Stata 6.0. Coefficient t-values in parentheses. Significance levels: †(0.01), **(0.05), *(0.10); p-values of diagnostics in [].
2. The Hausman test accepts the null hypothesis of no misspecification. $\chi^2(48)=1.62[1.00]$.

Residential location has a significant impact on the reservation wage. Residing in Thanet depresses the reservation wage by just under 10 per cent. For Canterbury and Dover the reduction is between 3 and 4 per cent. Lower reservation wages may reflect regional disparities in pay and/or skills. Average weekly wages are significantly lower in East Kent. This may reflect the latent employment/industrial structure of the region or a distance from London effect. However, it is also consistent with the disproportionately high number of workers without qualifications. Human Capital theory asserts that workers are remunerated according to their marginal product of labour. On this basis, less qualified workers can expect to earn less. Accordingly, reservation wages should also be lower.

Search behaviour also yields a significant impact on reservation wages. Individuals who make speculative inquiries or use newspapers and journals have reservation wages 8 per cent higher than those who utilise job centres. For individuals using private employment agencies, the increase in the reservation wage is some 13 per cent. Hence, individuals who utilise alternative search methods expect to earn higher wages. This result may indicate that workers expect to be compensated for any additional costs incurred in the search process. It could, however, reflect the characteristics of the workers involved and the efficient matching of workers skills to employer needs. Qualified workers

disproportionately represent individuals who report using such methods. These workers have higher reservation wages: They expect to earn wages that reflect their higher marginal productivity. Thus, a positive association between reservation wages and alternative search methods may be expected.

Column 3 reveals that the signs of parameter estimates for demographic and personal covariates on the log of unemployment duration are again as one would expect *a priori*. Age and gender have highly statistically significant effects on the probability of remaining unemployed. Women can expect to experience far shorter spells of unemployment than men, perhaps reflecting competing risks in the exit from unemployment. Younger workers can expect likewise. Workers aged between 16 and 19 years experience unemployment durations 29 per cent shorter than those in the reference category. Workers aged 30 years or more, in contrast, can expect unemployment durations between 12 and 20 per cent longer. The presence of a health problem does not appear to be an important determinant of unemployment duration. Neither is marital status. Both results are somewhat surprising. The lack of statistical significance regarding health problems may reflect sampling bias in the unemployment register.[36] The lack of significance for marital status is again likely to reflect differences in the experience of unemployment by gender.

Individuals who possess at least some qualifications can expect significantly shorter spells of unemployment. Negative parameter estimates regarding educational attainment are consistent with human capital theory. However, it is the presence of broad-based qualifications that present the greatest reduction in the probability of remaining unemployed. Unemployed individuals with 'O'-level or equivalent qualifications can expect unemployment durations 14% shorter than those individuals without formal qualifications. This rises to 22% for those with vocationally based NVQs. Both of these qualifications act as an entry-level screening device for both employers and academic institutions alike. The lack of such qualifications can thus be expected to have adverse consequences for individuals' (re)employment probabilities.

Previous occupation is a significant determinant of unemployment duration. It is well known that certain occupations are prone to a greater incidence of unemployment. The impact on unemployment duration is, however, less clear. In terms of our sample,

workers previously employed in semi-skilled occupations can expect shorter unemployment durations than the reference group of craft and related occupations. By contrast, unskilled workers previously employed as plant and machine operatives can expect longer durations. There is no statistically significant effect for those workers previously engaged in 'professional' and related occupations.

Labour market mobility also has a vital role in determining the duration of unemployment. Individuals willing to travel in excess of one hour experience unemployment durations some 14% shorter than the reference category. More significantly, workers with their own transport experience significantly shorter unemployment durations regardless of travel time. This result is highly significant and indicates that lack of mobility may present a serious constraint to policies aimed at improving the long-term employability of the unemployed. Promoting the use of informal networks and 'other' search activities may help in this regard. Individuals who utilise such methods experience unemployment spells 33 per cent shorter than those utilising more formal methods.

Regional variation in labour market opportunities also yields significant impacts on the length of time individuals can expect to remain unemployed. Individuals residing in the East and North Kent districts of Ashford, Dartford, and Rochester can expect unemployment durations between 11 and 18 per cent longer than those residing in the reference region of Maidstone (Mid-Kent). For Canterbury and Gillingham, the expected increase in unemployment duration is 56 per cent and 30 per cent respectively. The districts with significantly lower durations are the East and North Kent districts that report both the highest incidence of unemployment and the lowest proportions of long-term unemployed. This result is somewhat surprising. However, as reported previously, these districts disproportionately represent unskilled workers. A high incidence of unemployment together with short unemployment durations suggests labour market 'churning' in these districts may be considerable. This is consistent with the earlier hypothesis that such districts may consist of relatively poor employment opportunities. It also provides confirmation that, *ceteris paribus*, geographical variation in the arrival rate of job offers due to local demand conditions is a significant determinant of unemployment duration.

The socio-economic and demographic parameter estimates reported in the IV specification of column 3 are not systematically different from the structural estimates reported in column 1. The role of the log reservation wage on the log of unemployment duration also holds in this regard. Both specifications report a perverse negative sign on the log reservation wage though neither parameter estimate is statistically significant at conventional levels. A negative sign on the log reservation wage implies that higher reservation wages reduce the probability of remaining unemployed. Thus, unemployment duration should be shorter. This result is at odds with job search theory. However, one possible explanation may lie in the static nature of the cross-section data. The data entails that the focus of explanatory variables is on the incomplete duration of unemployment at a point in time (unemployment spells are right-censored). We have already reported that qualified workers, mobile workers, and workers utilising non-traditional search methods have shorter durations of unemployment. These workers also report significantly higher reservation wages. Thus, a negative coefficient for the log reservation wage in the estimation of the log of unemployment duration may reflect strong correlation between such factors.

The reduced form specification for the log of unemployment duration is appropriate if reservation wages are correlated with omitted variables. If there are omitted variables, parameter estimates for the IV specification will be consistent and unbiased, but the parameter estimate of the log of reservation wages in the structural specification will be biased. This bias can be tested formally using a Hausman test.[37] The null hypothesis of the Hausman test is that the IV and structural estimates have no measurement error. Under the null hypothesis, both estimators are consistent estimators, although the IV estimator is inefficient. The Hausman test does not reject the null hypothesis of no misspecification. Thus, the structural equation is the appropriate method of estimation and the reservation wage is not statistically significant in the determination of unemployment duration.[38]

In order to confirm the generality and robustness of our results, two additional experiments were performed. Firstly, we investigated the validity of the instruments utilised in the first stage of the IV procedure. A good instrument for our econometric model is one that is correlated with the log reservation wage but not significantly correlated with the log of unemployment duration. The first-stage IV estimates reported

in column 2 of Table 4 indicate that, of our two chosen instruments, the log of previous earnings has a more significant correlation with the log reservation wage than whether the individual was previously self-employed. Since we have two instruments but only one variable to instrument, we can test the validity of one instrument by assuming the validity of the other. Thus, we test the validity of the log of previous earnings by including it in the second-stage duration equation where the self-employed variable is used as the sole instrument in the first stage. The parameter estimate for the log of previous earnings is positive but insignificant with a t-ratio of 0.53. This suggests that the over-identifying restriction that the log of previous earnings is a valid instrument is accepted.

Secondly, we estimate our wage and duration equations separately for men and women. The full sample reveals that women experience significantly shorter unemployment durations than men. This contrast in the experience of unemployment is likely to reflect gender differences in the exit probability into non-participation. The inability to control for competing risks by gender may yield potential biases in parameter estimates when covariates are estimated over the full sample. Thus, re-estimating the econometric specifications for men and women separately should test whether our conclusions hold *a fortiori*.

The results of estimating separate equations for men and women are reported in Tables A5 and A6 of the Appendix. These indicate significant variation in the determinants of unemployment duration across gender. Regardless of gender, older workers have both higher reservation wages and unemployment durations. The impact on unemployment duration is, however, only statistically significant at conventional levels for women aged 50 or over. The effect is also twice that observed for men. This may reflect labour market discrimination on the part of employers. Alternatively, it could reflect a greater accumulation of firm specific capital and hence greater hiring costs.

Higher educational attainment significantly increases the reservation wages of men and women. Support for the shorter unemployment durations arising through broad based qualifications is also supported. The impact of 'O'-level qualifications on the probability of remaining unemployed is broadly equivalent across gender. However, NVQs have no significant impact on female durations. This is likely to reflect sampling

bias and/or differences in participation. Nonetheless, support for 'minimal' levels of educational attainment suggest that policies aimed at the provision of training and improving workers skills may exercise potentially important impacts on improving the long-term employability of the unemployed.

Marital status and health are important determinants of male reservation wages but have no significant effect on male unemployment duration. The converse is true for women. Unemployed women reported as separated, divorced or widowed experience unemployment spells some 15 per cent longer than those who are single. This may reflect greater non-labour income. Such information is not observed in the data set. However, the presence of such income is likely to result in greater choosiness by the unemployed in terms of their acceptance set of job offers and thus longer durations. Differential impacts by gender are also observed with regards to labour market mobility. Reservation wages are significantly higher for persons willing to travel for longer regardless of gender, perhaps reflecting the increased costs of search. A negative impact on unemployment duration is, however, only observed for men. Having one's own transport significantly reduces the duration of unemployment regardless of gender. The effect on male durations is, however, almost twice that observed for females.

Previous occupation exerts significant impacts on the reservation wages and unemployment duration of both genders. Professional occupations exert a significant negative on the unemployment duration of women. Managerial and clerical occupations perform likewise. Sales occupations have strong impacts on both females and males, reducing the duration of unemployment by 36 per cent and 23 per cent respectively. District dummies continue to exercise statistically significant effects on the duration of unemployment. Thus, our main finding that variation in the arrival rate of job offers has a significant impact on individuals' unemployment experiences remains unaffected by this dichotomisation of the data.

VII. Conclusions

This paper has investigated the impact of individual heterogeneity and local labour market opportunities on the duration of unemployment exploiting a unique regional dataset for the English County of Kent. Utilising an econometric model tied closely to

job search theory, our results reveal that individual characteristics and related 'choice' variables' such as educational attainment, labour market mobility and job search behaviour exercise important impacts on the duration of unemployment. However, after controlling for such factors, there remain significant geographical variations. These results are robust for both males and females. They are also consistent with a number of previous studies that recognise the importance of individual characteristics in determining the risks associated with unemployment, and unemployment duration (Nickell, 1980; Jones, 1988; Gorter & Gorter, 1993).

Identifying the role of geography and individual heterogeneity has important implications for policy. If the length of an unemployment spell is primarily attributable to the demographic and personal characteristics of the unemployed, economic policies should be targeted at altering those characteristics observed to exercise significant effects. In terms of resource management, the selection criteria for such policies should also focus on the duration of unemployment. This has been the basis of the New Deal, a government-supported training and re-employment program targeted at getting the long-term unemployed back into employment. The New Deal is a key part of the Government's Welfare to Work strategy, and has helped over 560,000 people to find work over the past three years. The relative success of this program has resulted in a widening of the policy across a number of socio-economic groups including both the young and old, lone parents and those with a disability. The next phase of the program is intended to extend this coverage further.

The existence of regional influences raises concern over the long-term efficacy of the New Deal program. Recognition that geography is important suggests that microeconomic supply-side policies designed to increase the employability of the unemployed need also be complemented with more macroeconomic demand-led management. This, in turn, implies a greater role for both regional and urban economic policies. These policies have witnessed an element of resurgence since the mid to late 1990s with decentralisation of regional governance and greater emphasis on the central economic objective of high and stable levels of growth and employment. This revival represents a commitment towards the development of long-term partnerships between local government bodies, communities and employers alike. Our results provide broad support for this approach and indicate that urban based policies, alongside

neighbourhood renewal, are essential to providing the efficient matching of workers and employers at the sub regional level. They also suggest a more integrated strategy for the implementation of urban and regional policy, such as the recently created Frameworks for Regional Employment and Skills Action (FRESAs).

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[1] Claimant count data reveal that just under one half of the unemployed leave the register within 3 months. By contrast, one fifth of claimants remain unemployed after 1 year.

[2] Recent evidence from the labour force survey suggests 3½ million households with adult members of working age are without work. See Hastings (1997) for further details.

[3] The increased availability of good, reliable microeconomic data, alongside the development of related econometric techniques, has also contributed to this cause (Lancaster, 1990).

[4] Oswald (1997) provides some evidence for the (un)happiness of unemployed workers.

[5] See Layard *et al* (1991) for details.

[6] Jackman *et al* (1989) have utilised this decomposition extensively to show that changes in UK unemployment between the 1960s and 1980s can be attributed to changes in duration that arise from a marked downward trend in the outflow rate from unemployment.

[7] Equivalent data at the county level, for example, reveals variation in ILO unemployment for the South-East to be between 2.5% and 8.2%. Analysis of claimant count data at the level of the Local Authority District (LAD) underscores this pattern further.

[8] With few exceptions, setting a low reservation wage or being willing to consider a broad range of jobs has no significant impact on the conditional probability of exit from unemployment.

[9] Data on reservation wages is extremely rare. In the absence of such information, studies tend to utilise information regarding the eligibility for benefit or the receipt of such benefit to model individual choice indirectly.

[10] See DfES (2002) for details.

[11] In this framework, the job is completely characterised by the wage.

[12] Devine & Kiefer (1991) provide an excellent survey of the empirical literature.

[13] See Atkinson & Micklewright (1992) for a critical review.

[14] The authors conclude that earlier results indicating high levels of search effort amongst benefit recipients relative to non-recipients probably reflect participatory factors brought about by selectivity bias in the estimation procedure.

[15] See Atkinson *et al* (1984) for an examination of the sensitivity of the hazard rate across workers.

[16] The idea that past unemployment experience may determine current unemployment is recognised as 'state dependence' in the statistical literature and 'scarring' in the economics literature.

[17] Such policies may focus on the demand- or supply-side of the labour market. Supply-side considerations emphasise depreciation in skills (Sinfield, 1981) and worker demoralisation (Pissarides, 1985). Demand-side considerations stress the importance of firms' hiring functions and associated roles of discrimination (Harrison, 1976) and screening (Lockwood, 1991; Pissarides, 1992).

[18] See Mortensen & Neumann (1984) for details.

[19] Information concerning employment opportunities may be derived from both formal and informal methods. Formal methods include the use of employment agencies, direct approaches to employers, and/or responses to advertisements in newspapers and journals. Informal methods, by contrast, may utilise social networks (friends & relatives) and ports of access to internal labour markets.

[20] The unemployed individual may decide to become choosier for a given increase in the arrival rate of job offers.

[21] It should, of course, be noted that one reason why offer rejections are typically rare is because the rejection of an offer may often mean disqualification from unemployment insurance payments.

[22] NOMIS records for October 1992 reveal that 78% of Kent's unemployed constituted men, with 22% women. The survey sample of 5,392 individuals comprises 76% men and 24% women.

[23] The survey slightly under-represents persons unemployed between 0 and 3 months, and 12 months & over. Similarly, persons unemployed between 3 and 12 months are slightly over-represented.

[24] One exception to this is that we include those individuals who either fail to report the wage earned from their previous employment or have a missing response to the question on the basis that they have not previously worked. For these individuals, the previous wage is imputed from existing data.

[25] We presume that the incidence of invalid responses is independent of the nature of other responses. Data mining provides credence here. Extensive cross-tabulations reveal that the estimable sample is representative of the survey design. Hence, selected individuals appear to be a fairly random draw.

[26] The distribution is estimated using kernel density estimation and constraining the upper bound of unemployment duration to 30 months.
[27] This is particularly evident for married women who often consider employment in order to provide households with a secondary income
[28] Marital status is also important here with married women being identified as least likely to commute greater times (and hence distances).
[29] These differentials are highlighted in the construction of a variable that reflects the ratio of reservation wages to previous earnings. This ratio has a mean of 1.051 in the sample with a standard deviation of 0.678 and a median of 0.999.
[30] This partially reflects the nature of the benefit administration scheme in the UK.
[31] The fourteen districts considered are: Ashford, Canterbury, Dartford, Dover, Gillingham, Gravesham, Maidstone, Medway, Rochester, Sevenoaks, Shepway, Swale, Thanet, Tonbridge & Malling, and Tunbridge Wells.
[32] The empirical methodology developed here is that of Jones (1988).
[33] See Lancaster (1990) for details.
[34] State dependence in the reservation wage also yields concerns for the estimation of equation (10). In general, state dependence entails that progression from equation (1) to equation (2) will no longer be valid. In this instance, the duration of unemployment and individuals' reservation wages may be considered as 2 endogenous variables in a simultaneous system. Lancaster (1985) demonstrates that under certain assumptions, a tractable expression for the reservation wage in a simultaneous system may be derived where the duration specification remains as in equation (10). This specification again warrants the use of instrumental variables to deal with the potential endogeneity bias outlined above. See Heath & Swan (1999) for additional details.
[35] Percentage differentials are calculated as $100 \times (e^{\beta_i} - 1)$. See Halvorsen & Palmquist (1980).
[36] Disney & Webb (1991) reveal that there has been a significant upward trend in the receipt of long-term sickness benefits. This trend appears to be positively correlated with higher unemployment but insensitive to reductions in the aggregate unemployment rate. They tentatively suggest that this discrepancy may be due to asymmetry in the relationship between unemployment and sickness benefits. It could, however, also reflect changing eligibility conditions for other benefits (such as unemployment benefit).
[37] See Hausman (1978).
[38] This result is consistent with Gorter & Gorter (1993) but contrasts with Dolton & O'Neil (1995) and Warren (1999) both of whom report the reservation wage as having a significant positive effect on the unemployment experience of the *long-term* unemployed.

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APPENDIX

Table A1

Unemployment Duration and Age

	Unemployment Duration (months)						
Age of Individual	0 to 3	3-6	6-12	12-18	18-24	24+	Total
16-19	129	124	96	24	7	2	382
20-29	584	468	439	157	74	114	1,839
30-39	310	236	251	100	69	74	1,040
40-49	243	241	200	83	56	67	890
50+	219	163	176	60	32	71	721
Total	1,485	1,232	1,162	424	238	331	4,872

Table A2

Unemployment Duration and Educational Attainment

	Unemployment Duration (months)						
Highest Qualification	0 to 3	3-6	6-12	12-18	18-24	24+	Total
Degree, HND/HNC	88	70	70	24	11	13	276
A-level	110	62	61	20	14	15	282
City & Guilds	211	152	164	57	29	34	647
O-level or Equivalent	478	362	313	78	42	44	1,317
NVQ	22	21	16	5	4	3	71
Other Qualifications	61	62	60	33	10	17	243
No Qualification	515	503	478	207	128	205	2,036
Total	1,485	1,232	1,162	424	238	331	4,872

Table A3

Unemployment Duration and Residence

	Unemployment Duration (months)						
District	0 to 3	3-6	6-12	12-18	18-24	24+	Total
Ashford	73	72	70	32	17	30	294
Canterbury	82	66	117	57	46	60	428
Dartford	106	62	75	47	39	36	365
Dover	194	124	76	1	0	0	395
Gillingham	75	85	105	56	33	47	401
Gravesham	94	51	37	13	5	6	206
Maidstone	123	100	129	28	12	21	413
Rochester	126	115	127	54	24	34	480
Sevenoaks	27	22	17	6	1	0	73
Shepway	116	70	80	54	27	47	394
Swale	131	115	107	24	14	24	415
Thanet	205	219	115	5	1	2	547
Tonbridge & Malling	119	120	95	44	17	22	417
Tunbridge Wells	14	11	12	3	2	2	44
Total	1,485	1,232	1,162	424	238	331	4,872

Table A4

Data Definitions & Summary Statistics

Variable	All Persons		Males		Females	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Dependent Variables						
Log of Unemployment Duration						
Log of Reservation Wage	5.086	0.389	5.170	0.367	4.823	0.339
Independent Variables						
Gender (1,0 if female)	0.241		-		-	
Age	34.10	12.23	34.84	12.28	31.80	11.78
Marital Status						
Never Married (reference)	0.463		0.460		0.472	
Married or Living as a Couple	0.399		0.414		0.352	
Separated, Divorced or Widowed	0.138		0.126		0.176	
Highest Qualification						
First or Higher Degree, HND or HNC	0.057		0.057		0.054	
GCE A-level	0.058		0.053		0.074	
City & Guilds	0.133		0.156		0.060	
GCE O-level or equivalent	0.270		0.230		0.396	
NVQ	0.015		0.013		0.019	
Other Qualification	0.050		0.053		0.041	
No Qualification (reference)	0.417		0.438		0.356	
Search Methods						
Job Centre (reference)	0.728		0.718		0.760	
Newspapers & Journals	0.180		0.178		0.189	
Private Employment Agency	0.018		0.017		0.022	
Speculative Inquiry	0.067		0.079		0.026	
Other	0.007		0.008		0.003	
Travel Time						
0-14 Mins. (reference)	0.090		0.073		0.141	
15-29 Mins.	0.233		0.185		0.386	
30-44 Mins.	0.192		0.188		0.205	
45-60 Mins.	0.145		0.158		0.106	
60+ Mins.	0.340		0.396		0.162	
Previous Occupation						
Managers and Administrators	0.066		0.071		0.049	
Professional Occupations	0.031		0.032		0.026	
Associate Professionals and Technical	0.043		0.045		0.040	
Clerical and Secretarial	0.108		0.062		0.252	
Craft and Related (reference)	0.218		0.276		0.036	
Personal and Protective Services	0.078		0.052		0.161	
Sales	0.090		0.062		0.180	
Plant and Machine Operatives	0.113		0.134		0.045	
Other Occupations	0.188		0.210		0.117	
No Previous Job	0.065		0.056		0.094	
Other Personal Controls						
Health Problem	0.088		0.087		0.092	
Literacy Problem	0.028		0.031		0.019	
Have Own Transport	0.385		0.407		0.313	
Want to Work Part-time	0.009		0.004		0.023	
Previously Self-employed	0.184		0.234		0.028	
Log of Previous Wage	5.134	0.553	5.247	0.511	4.782	0.534
District						
Ashford	0.060		0.061		0.057	
Canterbury	0.088		0.094		0.070	
Dartford	0.075		0.074		0.079	
Dover	0.081		0.082		0.078	
Gillingham	0.082		0.081		0.086	

Gravesham	0.042	0.041	0.045
Maidstone (reference)	0.085	0.085	0.083
Rochester	0.099	0.102	0.089
Sevenoaks	0.015	0.012	0.026
Shepway	0.081	0.087	0.062
Swale	0.085	0.078	0.107
Thanet	0.112	0.114	0.106
Tonbridge & Malling	0.086	0.081	0.101
Tunbridge Wells	0.009	0.008	0.011

Table A5

Estimation Results for Male Sample

			Instrumental Variables			
	MLE		IV First Stage		IV Second Stage	
Dependent Variable	Log Duration		Log w^r		Log Duration	
Log Reservation Wage (w^r)	-0.029	(1.63)	-	-	-0.234	(1.94)*
Instruments						
Previously Self-employed	-	-	0.048	(4.58)†	-	-
Log Previous Wage	-	-	0.313	(31.20)†	-	-
Personal Characteristics						
Age 16-19	-0.373	(5.09)†	-0.101	(5.34)†	-0.423	(5.46)†
30-39	0.129	(2.79)†	0.067	(5.60)†	0.151	(3.17)†
40-49	0.207	(3.94)†	0.085	(6.20)†	0.233	(4.31)†
50+	0.086	(1.50)	0.021	(1.39)	0.100	(1.74)*
Married or Living as a Couple	0.007	(0.17)	0.107	(9.74)†	0.041	(0.89)
Separated, Divorced or Widowed	-0.064	(1.14)	0.032	(2.21)**	-0.050	(0.88)
Health Problem	-0.040	(0.67)	-0.033	(2.18)**	-0.054	(0.91)
Literacy Problem	0.026	(0.29)	-0.003	(0.10)	-0.042	(0.45)
Have Own Transport	-0.722	(20.25)†	0.025	(2.68)†	-0.713	(19.83)†
Want to Work Part-time	-0.049	(0.19)	-0.154	(2.34)**	-0.104	(0.40)
Educational Attainment						
First or Higher Degree, HND or HNC	-0.028	(0.34)	0.028	(1.31)	-0.013	(0.16)
GCE A-level	-0.010	(0.13)	0.033	(1.65)*	-0.003	(0.03)
City & Guilds	-0.100	(1.97)**	0.014	(1.06)	-0.091	(1.78)*
GCE O-level or Equivalent	-0.153	(3.38)†	0.006	(0.53)	-0.151	(3.33)†
NVQ	-0.337	(2.38)**	0.050	(1.36)	-0.320	(2.26)**
Other Qualification	0.039	(0.53)	0.024	(1.23)	0.046	(0.62)
Search Activity						
Newspapers & Journals	-0.039	(0.85)	0.077	(6.60)†	-0.012	(0.26)
Private Employment Agency	-0.015	(0.11)	0.104	(3.12)†	0.026	(0.20)
Speculative Inquiry	-0.033	(0.52)	0.089	(5.51)†	-0.004	(0.07)
Other	-0.292	(1.63)	0.022	(0.47)	-0.279	(1.55)
Travel Time (minutes)						
15-29	-0.193	(2.75)†	0.041	(2.22)**	-0.182	(2.58)†
30-44	-0.175	(2.41)**	0.088	(4.64)†	-0.150	(2.05)**
45-60	-0.126	(1.71)*	0.073	(3.81)†	-0.101	(1.36)
60+	-0.238	(3.40)†	0.136	(7.45)†	-0.193	(2.62)†
Previous Job						
Managers and Administrators	-0.006	(0.09)	0.016	(0.83)	0.065	(0.09)
Professional Occupations	-0.002	(0.18)	-0.004	(0.14)	-0.001	(0.00)
Associate Professionals and Technical	-0.201	(2.31)**	-0.010	(0.47)	-0.201	(2.31)
Clerical and Secretarial	-0.099	(1.32)	-0.081	(4.15)†	-0.127	(1.66)*
Personal and Protective Services	-0.090	(1.14)	-0.106	(5.16)†	-0.130	(1.60)
Sales	-0.231	(3.10)†	-0.070	(3.66)†	-0.267	(3.48)†
Plant and Machine Operatives	0.140	(2.55)**	-0.052	(3.58)†	0.121	(2.18)**
Other Occupations	0.027	(0.55)	-0.061	(4.79)†	0.004	(0.09)
No Previous Job	0.117	(1.44)	-0.154	(7.32)†	0.085	(1.03)
District						
Ashford	0.187	(2.20)**	0.008	(0.38)	0.191	(2.25)**
Canterbury	0.430	(5.63)†	-0.037	(1.84)*	0.417	(5.44)†
Dartford	0.182	(2.22)**	0.082	(3.83)†	0.205	(2.47)**
Dover	-0.552	(6.69)†	-0.025	(1.19)	-0.559	(6.78)†
Gillingham	0.269	(3.35)†	0.052	(2.47)**	0.284	(3.53)†
Gravesham	-0.324	(3.30)†	0.075	(2.99)†	-0.303	(3.07)†
Rochester	0.157	(2.12)**	0.076	(3.95)†	0.180	(2.41)**
Sevenoaks	-0.220	(1.38)	0.027	(0.66)	-0.218	(1.36)
Shepway	0.095	(1.20)	0.014	(0.67)	0.101	(1.27)
Swale	-0.015	(0.19)	0.008	(0.39)	-0.012	(0.16)

Thanet	-0.363	(4.72)†	-0.078	(3.92)†	-0.391	(5.01)†
Tonbridge & Malling	0.107	(1.38)	0.027	(1.31)	0.117	(1.50)
Tunbridge Wells	0.011	(0.06)	-0.029	(0.61)	0.008	(0.04)
Constant	2.284	(7.80)†	3.443	(60.05)†	3.332	(5.57)†
Diagnostics						
F	-		90.63 [0.00]		-	
LR χ^2	960.61		-		964.25	
R^2	-		0.5439		-	
Log Likelihood	-5524.5598		-		-5522.7392	
N	3,697		3,697		3,697	

Notes

1. See notes to Table 4.
2. The Hausman test accepts the null hypothesis of no misspecification. $\chi^2(47)=3.59[1.00]$.

Table A6

Estimation Results for Female Sample

			Instrumental Variables			
	MLE		IV First Stage		IV Second Stage	
Dependent Variable	Log Duration		Log w^r		Log Duration	
Log Reservation Wage (w^r)	-0.267	(2.80)	-	-	-0.085	(0.34)
Instruments						
Previously Self-employed	-	-	0.075	(1.55)	-	-
Log Previous Wage	-	-	0.245	(13.84)†	-	-
Personal Characteristics						
Age 16-19	-0.142	(1.43)	-0.024	(0.84)	-0.126	(1.23)
30-39	0.131	(1.58)	0.046	(1.94)*	0.119	(1.40)
40-49	0.059	(0.64)	0.050	(1.88)*	0.045	(0.48)
50+	0.279	(2.66)†	0.056	(1.81)*	0.264	(2.48)**
Married or Living as a Couple	0.024	(0.33)	0.020	(0.97)	0.017	(0.23)
Separated, Divorced or Widowed	0.164	(1.77)*	0.033	(1.27)	0.157	(1.68)*
Health Problem	-0.051	(0.52)	0.029	(1.04)	-0.054	(0.55)
Literacy Problem	0.244	(1.23)	0.006	(0.11)	0.249	(1.26)
Have Own Transport	-0.375	(5.89)†	0.020	(1.11)	-0.382	(5.92)†
Want to Work Part-time	-0.144	(0.77)	-0.220	(4.16)†	-0.096	(0.49)
Educational Attainment						
First or Higher Degree, HND or HNC	-0.189	(1.23)	0.113	(2.58)†	-0.212	(1.36)
GCE A-level	-0.139	(1.16)	0.072	(2.09)**	-0.155	(1.27)
City & Guilds	-0.007	(0.05)	0.094	(2.56)**	-0.027	(0.21)
GCE O-level or Equivalent	-0.128	(1.72)*	0.078	(3.65)†	-0.146	(1.88)*
NVQ	-0.071	(0.34)	0.127	(2.14)**	-0.109	(0.52)
Other Qualification	0.084	(0.59)	0.040	(0.96)	0.071	(0.50)
Search Activity						
Newspapers & Journals	0.044	(0.59)	0.061	(2.89)†	0.030	(0.39)
Private Employment Agency	0.007	(0.03)	0.141	(2.58)†	-0.023	(0.11)
Speculative Inquiry	0.099	(0.56)	-0.042	(0.84)	0.113	(0.64)
Other	-	-	0.175	(1.32)	-	-
Travel Time (minutes)						
15-29	-0.046	(0.52)†	0.041	(1.59)	-0.054	(0.61)
30-44	0.075	(0.76)	0.074	(2.57)†	0.059	(0.58)
45-60	-0.097	(0.81)	0.060	(1.75)*	-0.109	(0.90)
60+	-0.105	(0.90)	0.147	(4.42)†	-0.139	(1.11)
Previous Job						
Managers and Administrators	-0.336	(1.78)*	0.069	(1.25)	-0.366	(1.89)*
Professional Occupations	-0.494	(2.05)**	0.088	(1.27)	-0.520	(2.12)**
Associate Professionals and Technical	-0.001	(0.00)	0.094	(1.61)	-0.120	(0.10)
Clerical and Secretarial	-0.335	(2.19)**	-0.021	(0.46)	-0.331	(2.16)**
Personal and Protective Services	-0.294	(1.89)*	-0.091	(1.98)**	-0.263	(1.64)
Sales	-0.331	(2.15)**	-0.047	(1.04)	-0.308	(1.97)*
Plant and Machine Operatives	-0.329	(1.75)*	-0.104	(1.89)*	-0.309	(1.62)
Other Occupations	-0.185	(1.15)	-0.095	(1.99)**	-0.152	(0.92)
No Previous Job	-0.198	(1.17)	-0.103	(2.06)**	-0.173	(1.01)
District						
Ashford	0.003	(0.02)	-0.075	(1.75)*	0.013	(0.09)
Canterbury	0.539	(3.92)†	-0.011	(0.27)	0.544	(3.93)†
Dartford	0.041	(0.30)	-0.011	(0.28)	0.040	(0.29)
Dover	-0.502	(3.55)†	-0.033	(0.82)	-0.495	(3.49)†
Gillingham	0.152	(1.14)	-0.105	(2.70)†	0.173	(1.27)
Gravesham	-0.215	(1.35)	-0.047	(1.03)	-0.213	(1.33)
Rochester	-0.122	(0.95)	-0.016	(0.43)	0.121	(0.94)
Sevenoaks	-0.206	(1.07)	0.045	(0.81)	-0.221	(1.13)
Shepway	0.102	(0.70)	-0.045	(1.06)	0.104	(0.71)
Swale	-0.172	(1.35)	-0.008	(0.23)	-0.165	(1.30)

Thanet	-0.411	(2.98)†	-0.106	(2.71)†	-0.387	(2.72)†
Tonbridge & Malling	-0.083	(0.66)	-0.061	(1.65)*	-0.075	(0.59)
Tunbridge Wells	-0.180	(0.65)	0.001	(0.01)	-0.196	(0.71)
Constant	-3.249	(6.62)†	3.572	(35.12)	2.389	(1.99)**
Diagnostics						
F	-		17.53 [0.00]		-	
LR χ^2	228.54		-		220.82	
R^2	-		0.4276		-	
Log Likelihood	-1625.1663		-		-1.629.0303	
N	1,175		1,175		1,175	

Notes

1. See notes to Table 4.
2. Stata 6.0 drops 'other' search method from estimation of unemployment duration on the basis that observations are only recorded for women experiencing an unemployment spell of between 0 and 3 months.
3. The Hausman test accepts the null hypothesis of no misspecification. $\chi^2(46)=2.44[1.00]$.