DISCUSSION PAPER SERIES

IZA DP No. 3981

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January 2009

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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ABSTRACT

Reservation Wages, Expected Wages and the Duration of Unemployment: Evidence from British Panel Data*

In this paper we analyse the role of wage expectations in an empirical model of incomplete spells of unemployment and reservation wages. To be specific, we model the duration of unemployment, reservation wages and expected wages simultaneously for a sample of individuals who are not in work, where wage expectations are identified via an exogenous policy shock based upon the introduction of Working Family Tax Credits (WFTC) in the UK. The results from the empirical analysis, which is based on the *British Household Panel Survey*, suggest that WFTC eligibility served to increase expected wages and that expected wages are positively associated with reservation wages. In addition, incorporating wage expectations into the econometric framework was found to influence the magnitude of the key elasticities: namely the elasticity of unemployment duration with respect to the reservation wage and the elasticity of the reservation wage with respect to unemployment duration.

JEL Classification: J13, J24, J64

Keywords: expected wages, reservation wages, unemployment duration

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* We are grateful to the ESRC for financial support under grant number RES-000-22-2004 and to the Data Archive, University of Essex, for supplying the *British Household Panel Surveys*, 1996 to 2002. We would also like to thank Professors Andy Dickerson and Jennifer Roberts for valuable comments. We are also very grateful to the Editor and an anonymous referee for excellent comments. The normal disclaimer applies.

I. Introduction and Background

The reservation wage, the lowest wage at which an individual is willing to work, plays a key role in labour market theory. In particular, the reservation wage plays an important role in theoretical models of job search, labour supply and labour market participation (see, for example, Mortensen, 1986, Mortensen and Pissarides, 1999, and Pissarides, 2000). An extensive empirical literature exists, which has explored the implications of reservation wage setting at the individual level focusing on the relationship between reservation wages and the duration of unemployment, an area of particular interest to policy-makers, with seminal contributions made by Lancaster and Chesher (1983, 1984) and Jones (1988).

The empirical evidence has supported a positive relationship between reservation wages and the duration of unemployment as predicted by optimal job search theory, i.e. high reservation wages are associated with longer spells of unemployment. It is important to acknowledge that there have been a number of issues, which have complicated the empirical analysis in this area. For example, there is a shortage of data sets which include information relating to reservation wages at the individual level, with early studies based on the offered wages of individuals who have been unemployed at some point in time (see Kiefer and Neumann, 1979). Furthermore, reservation wages and the duration of unemployment are arguably jointly determined: reservation wages influence the probability of exiting unemployment and reservation wages are influenced by the length of the spell of unemployment.

Two main approaches have been adopted in the empirical literature to explore the relationship between reservation wages and the duration of unemployment. Lancaster and Chesher (1983) pioneered an approach whereby, rather than estimating the response of reservation wages to the unemployment rate, they calculate the elasticity of the reservation wage with respect to the rate of arrival of job offers via non parametric procedures. This approach has been recently used by Blackaby et al. (2007) to explore the reservation wages of

'economically inactive' rather than unemployed individuals and by Addison et al. (2009) to explore reservation wage and unemployment duration elasticities across a number of European labour markets. The second approach which has been used extensively in the existing literature to explore the relationship between reservation wages and the duration of unemployment is the instrumental variables (IV) approach introduced by Jones (1988), which we adopt in order to allow for the joint determination of the reservation wage and the duration of unemployment.

In the existing empirical literature, it is apparent that, although the role of expected wages has been acknowledged, it has not been explicitly incorporated into the econometric analysis. For example, Lancaster and Chesher (1983) regard reservation wages, expected wages and the duration of unemployment as three jointly determined variables. However, in the context of their non parametric approach they do not calculate the effect of expected wages on reservation wages. In contrast, we aim to analyse the effect of expected wages on reservation wages and how including the expected wage into the framework influences the relationship between the reservation wage and the duration of unemployment. Thus, we expand the framework introduced by Jones (1988) by jointly modelling these three variables using individual level data drawn from the *British Household Panel Survey* (*BHPS*).

The inclusion of the expected wage within this framework is an important contribution to this area since, although its potential role has been alluded to in the existing empirical literature on reservation wages, its role on reservation wage setting has not been the focus of empirical scrutiny. This is not surprising, however, since although individuals' expectations play a central role in many areas of economic theory, microeconometric evidence of their causes and effects is relatively sparse. The work that does exist is predominately focused on financial expectations, exploring the motivation behind, for example, spending, saving and investment (see, for example, Brown et al., 2005, 2008, Das and van Soest, 1999 and Souleles, 2004). The absence of a wider research programme is

perhaps reflective of both a shortage of relevant data and scepticism amongst economists over the use of subjective information on expectations drawn from surveys (see Manski, 2004).

In order to contribute to the empirical literature on labour market expectations, we explore how a change in labour market policy in the UK influences the expected wages of individuals who are not in work. To be specific, we analyse how eligibility for Working Family Tax Credits (WFTC), which replaced and expanded the generosity of Family Credits in 1999, influences the expected wages of the unemployed. According to Brewer et al. (2006), the introduction of the WFTC in 1999 almost doubled the generosity of the previous in-work benefits associated with the Family Credits scheme, thereby aiming to encourage individuals currently on benefit into employment. Thus, the influence of the introduction of the WFTC on expected wages and the subsequent effects on reservation wages and the duration of unemployment present a potentially important contribution to the empirical literature in this area, which should be of particular interest to policy makers.

II. Data

Our empirical analysis is based on panel data drawn from the *BHPS*, which is a random sample survey, carried out by the *Institute for Social and Economic Research*, of each adult member from a nationally representative sample of more than 5,000 private households (yielding approximately 10,000 individual interviews). For wave one, interviews were conducted during the autumn of 1991. The same individuals are re-interviewed in successive waves. Given the availability of detailed information on job search in the *BHPS*, we focus on the time period 1996 to 2002. In addition, the start of our period of study coincides with the introduction of the Job Seekers Allowance (JSA) in the UK, which tightened the job search requirements for benefit eligibility. As detailed by Manning (2005), all claimants had to sign a Job Seeker's Agreement (JSA) indicating: the type of job sought; when the claimant is able

to work; and the steps taken to identify and apply for jobs. In 2003, Working Tax Credit and Child Tax Credit replaced WFTC, hence our sample ends in 2002.

The defining feature of the *BHPS* for our empirical study is that it contains detailed information on reservation wages, expected wages and the duration of unemployment at the individual level. To be specific, if the respondent '*is not currently working but has looked for work or has not looked for work in last four weeks but would like a job*', he/she is asked to specify: '*What is the lowest weekly take home pay you would consider accepting for a job?*' This series of questions is asked in all waves of the *BHPS*. Individuals who answer the question regarding lowest pay are then asked: '*About how many hours in a week would you expect to have to work for that pay?*' This enables us to construct the hourly reservation wage.[1] Turning to expected wages, in all waves of the *BHPS*, job seekers were asked: '*About how many hours in a week do you think you would be able to work*?' Such individuals are then explicitly asked about their expected wage: '*What weekly take-home pay would you expect to get (for that)?*' Hence, we are also able to construct the hourly expected wage. The duration of unemployment is measured as the length of time in the current labour market spell (measured in days), i.e. whether employed, self employed or not in work.

Our sample comprises those individuals not in employment or self-employment. The data set is unbalanced with 3,034 observations for the seven years where, on average, individuals are in the panel for two years. The sample includes individuals of working age (16-65) who satisfy the rationality restriction of Lancaster and Chesher (1983), i.e. that unemployment benefit income is less than or equal to the reservation wage, which in turn is less than or equal to the expected wage.[2] Out of the sample of individuals who are currently

[1] Given the reference to 'take home pay' in the question, it seems reasonable to assume that respondents would refer to the net (i.e. after tax) wage. It should be acknowledged that Hofler and Murphy (1994), who use stochastic frontier techniques to estimate reservation wages for a sample of employed individuals, argue that the reservation wage declared by individuals in surveys may be measured inaccurately. For example, individuals may not be well-informed enough to provide an accurate answer or it may be difficult to factor in non-wage characteristics of jobs, which may entice individuals into accepting job offers.

[2] Only 4% of the potential sample fail to meet this condition. This is consistent with Gorter and Gorter (1993) and Dolton and O'Neil (1995), where approximately 6% and 3% fail to meet the condition respectively.

not working and who state that they have looked for work or have not looked for work in the last four weeks but would like a job, 61.96% are typically classified as 'economically inactive'.[3] We include these individuals in the sample if they report a reservation wage, since in so doing they are arguably signaling their attachment to the labour market. Such an approach is in accordance with recent contributions in the labour economics literature, which recognise that the distinction between the unemployed and inactive may not necessarily be as clear-cut as previously assumed in the labour economics literature and that some of those traditionally labelled as inactive do actually want to work (see, for example, Schweitzer, 2003, and Blackaby et al., 2007).[4]

The distribution of the natural logarithm of the reservation wage is presented in Figure 1, where the mean log hourly reservation wage is 1.438, i.e. an hourly reservation wage of approximately £4.21. Similarly, the distribution of the natural logarithm of the expected wage is shown in Figure 2, where the mean log expected wage is 1.549, i.e. an hourly expected wage of approximately £4.71. Figure 3 shows the distribution of the natural logarithm of the number of days not in work, where the mean is 3.041, i.e. around 21 days, the minimum is 1 day and the maximum just over 1 year and 3 months. Full summary statistics are presented in Table 1A where all monetary values have been deflated to 1991 prices. The average age in the sample is 38 years old and 22% of individuals in the sample have a GCSE level qualification as their highest level of educational attainment. Most individuals who are not in work have undertaken at least one type of job search, which is consistent with JSA requirements.[5]

[3] The 'economically inactive' group includes: individuals involved in family care; full time students; the long term sick or disabled; and individuals involved in government training. In the *BHPS*, 1996 to 2002, 80.1% of those typically classified as 'economically' inactive do not specify a reservation wage, with the remaining 19.9%, who do specify a reservation wage, being included in our estimation sample. Amongst the latter, the 'family care' group dominates.

[4] Throughout the paper, the term unemployment duration describes the duration of being out of work for both groups, i.e. the unemployed and the 'economically' inactive.

[5] Job search is defined as an index of intensity of the number of types of search activity undertaken, i.e. whether the individual has applied directly to an employer, studied/replied to adverts, used an employment agency or a job centre.

III. Reservation Wages and the Duration of Unemployment

Methodology

In the *BHPS*, the duration of unemployment reflects a current rather than completed spell of unemployment as recorded at the interview date. Hence, by definition, when the reservation wage information is recorded, there are no exits from unemployment into employment, i.e. information on reservation wages is only reported for those who are not in work. In this context, Jones (1988) proposed the following structural model, i.e. a system of two simultaneous equations, estimated by instrumental variables on elapsed unemployment duration:

$$\begin{aligned} \log(t)_{it} &= \boldsymbol{X}_{1\mathrm{it}}\beta + \gamma \log(rw)_{it} + \varepsilon_{1it} \\ \log(rw)_{it} &= \boldsymbol{X}_{2\mathrm{it}}\phi + \lambda \log(t)_{it} + \varepsilon_{2it} \end{aligned} \tag{1}$$

where *i* and *t* denote the individual and time period respectively, $\log(t)$ is the log duration of the number of days not being in work, $\log(rw)$ is the log hourly reservation wage, $\boldsymbol{X}_1$ and $\boldsymbol{X}_2$ are vectors of variables which influence unemployment duration and the reservation wage respectively, β and ϕ are parameters to be estimated and capture the influence of the explanatory variables on the reservation wage and unemployment duration respectively, γ and λ measure the elasticity of unemployment duration with respect to the reservation wage and the elasticity of the reservation wage with respect to unemployment duration, and the ε's are random error terms. In accordance with the existing literature, we include the following variables in both $\boldsymbol{X}_1$ and $\boldsymbol{X}_2$: gender; ethnicity; marital status; highest level of educational attainment; the regional unemployment rate (see Jones, 1988, and Haurin and Sridhar, 2003)[6]; a quadratic in age; whether the individual is currently unemployed rather than 'economically inactive'; and the index of job search intensity. To identify the unemployment

[6] The regional unemployment rate is calculated from the Labour Force Survey (LFS) where the regions are defined as: East Anglia; East Midlands; West Midlands; Inner and Outer London; Rest of South East; South West; Greater Manchester and Merseyside; Tyne and Wear; Yorkshire and Rest of North; Scotland; and Wales.

duration equation, the vector $\boldsymbol{X}_2$ also includes: following Jones (1988), log unemployment benefits, which arguably influence job search costs; the log of the sum of all other types of benefit income; following Kiefer and Neumann (1979) and Hui (1991), the log of pay in last job; having a working spouse; the number of children under 16; and the number of dependent children aged 16 to 19. Our set of over-identifying instruments follows the existing literature and, in particular, is consistent with Lancaster (1985). In both the unemployment duration and reservation wage equations, we also include a set of region, year and month of interview binary controls.

Due to the panel nature of the data in order to allow for individual time invariant, i.e. fixed effects, we include a vector of individual level mean characteristics of time varying covariates for control variables in $\bar{\boldsymbol{Z}}_{1i}, \bar{\boldsymbol{Z}}_{1i} \supset \left\{ \bar{\boldsymbol{X}}_{1i}, \log\left(\overline{rw}\right) \right\}$, and $\bar{\boldsymbol{Z}}_{2i}$, $\bar{\boldsymbol{Z}}_{2i} \supset \left\{ \bar{\boldsymbol{X}}_{2i}, \log\left(\bar{t}\right) \right\}$, for the unemployment duration and reservation wage equations, respectively. This enables the parameters β, γ, ϕ and λ to be considered as an approximation to a fixed effects estimator. Hence, following Mundlak (1978), equation (1) is modified as follows:

$$\begin{aligned} \log\left(t\right)_{it} &= \boldsymbol{X}_{1\mathrm{it}}\beta + \gamma \log\left(rw\right)_{it} + \bar{\boldsymbol{Z}}_{1\mathrm{i}}\pi + \varepsilon_{1it} \\ \log\left(rw\right)_{it} &= \boldsymbol{X}_{2\mathrm{it}}\phi + \lambda \log\left(t\right)_{it} + \bar{\boldsymbol{Z}}_{2\mathrm{i}}\theta + \varepsilon_{2it} \end{aligned} \tag{2}$$

The Mundlak transformation to allow for fixed effects has been adopted in a range of labour market applications, see, for example, Korkeamäki and Kyyrä (1996), Barth (1997) and, more recently, Kirby and Riley (2008).

Results

We estimate equation (2) as a system of equations by two stage least squares.[7] The results are shown in Table 2 where the first column presents the unemployment duration equation whilst the second column presents the reservation wage equation. In accordance with the existing literature, higher education, specifically having a degree (undergraduate or post-graduate), is

[7] For brevity, we do not show the estimates of π and θ. These estimates are however available on request.

associated with a lower duration of unemployment. In line with the findings of Jones (1988), the length of unemployment duration is positively related to the regional unemployment rate, although only at the 10 percent level, as well as the age of the individual. We have also controlled for the influence of job search upon the length of the spell of unemployment and the results suggest that undertaking job search decreases the length of time not in work, which is consistent with the predictions of job search theory. For example, a one standard deviation increase in job search intensity decreases the number of days of not working by 17.5 percentage points. The elasticity of unemployment duration with respect to the reservation wage ($\hat{\gamma}$) is positive and statistically significant, supporting the predictions of job search theory, and is similar in magnitude to that reported in existing studies, such as Lancaster (1985) and Jones (1988), whilst being smaller in magnitude to the corresponding elasticity found by Dolton and O'Neill (1995).

Turning to the reservation wage equation, the results suggest that individuals who are male, highly educated and older have a higher reservation wage – findings which are broadly consistent with previous UK evidence, see, for example, Haurin and Sridhar (2003) and Gorter and Gorter (1993). A higher regional unemployment rate and being married or cohabiting are associated with a lower reservation wage. Whilst the elasticity of unemployment duration with respect to the reservation wage ($\hat{\lambda}$) is elastic, the elasticity of the reservation wage with respect to unemployment duration, in accordance with the findings in the existing literature, is inelastic and negative at -0.84.

As discussed above, the exclusion restrictions are based upon the existing literature and rely on identifying variables which influence unemployment duration only indirectly via the reservation wage, such as factors which affect the costs of job search. For an instrument to be valid, it must be correlated with the variable to be instrumented, i.e. the log reservation wage, and uncorrelated with the log duration of unemployment. A test of including the set of over-identifying instruments in the reservation wage equation reveals that, at the one percent

level, they are jointly significant. To be specific, benefit income is statistically significant as is the number of dependent children under 16, which is consistent with the findings of Jones (1988). Given that we have more than one instrument and that we are only instrumenting a single variable, i.e. the reservation wage, it is possible to identify the model by testing the validity of one instrument assuming the others are valid, see Cameron and Trivedi (2005). In particular, although not reported, we find that other benefit income and the number of children under 16 are statistically insignificant if included in the unemployment duration equation. Thus, the over-identifying restriction that the covariates are valid instruments appears appropriate.

To summarise, the findings accord with the existing literature in that the reservation wage serves to increase the duration of unemployment, whilst the duration of unemployment has a moderating influence on the reservation wage. As discussed in Section I, the expected wage plays an important role in job search theory, although this role has not been explored from an empirical perspective. Hence, we now focus on modeling unemployment duration, reservation wages and expected wages, simultaneously, in order to explicitly incorporate expected wages into the econometric framework.

IV. Reservation Wages, Expected Wages and the Duration of Unemployment

Methodology

As highlighted in the introduction, Lancaster and Chesher (1983) regard the reservation wage, expected wage and unemployment duration as jointly determined outcomes. In addition, they argue that job seekers might revise their reservation wage as their expected wage (i.e. potential income) fluctuates. Hence, in a stochastic framework the introduction of an unexpected change in labour market policy arguably acts as an exogenous shock, impacting on the expected wage, which in turn may influence the reservation wage and, subsequently, the duration of unemployment. In order to explore the impact of such a change in labour market policy, we focus on the introduction of WFTC in the UK.

Whilst a range of labour market policies such as the national minimum wage have been recently introduced in the UK, which have focused on increasing the returns from employment, the WFTC, in contrast, aimed to encourage those currently in receipt of benefit income into employment (Dilnot and McCae, 1999).[8] Eligibility for WFTC depended on hours of work (i.e. one adult in the family must work 16 hours or more a week), the number of dependent children (under 16 or under 19 and in full-time education) and capital (less than £8,000). Couples claimed jointly and need not be married. In addition, the scheme included payable childcare tax credit of up to 70% of costs incurred (Brewer et al., 2006). WFTC were introduced in October 1999 and were fully phased in by April 2000 with the principal aim of increasing labour market participation. Indeed, Brewer et al. (2006) found that WFTC increased the employment rate of lone mothers, reduced the labour supply of women in couples with children, and increased the labour supply of men in couples with children.

If the policy change is unexpected then a shift in the expected net income distribution is predicted, which may affect the reservation wage and, subsequently, unemployment duration. Figure 4 shows the expected wage distributions by WFTC eligibility: where for those individuals who are eligible for WFTC, the distribution is shifted to the right in comparison to that for those individuals who are ineligible for WFTC. Figures 5 and 6 show the reservation wage and unemployment duration distributions by WFTC eligibility, respectively. As with the expected wage distribution, there is some evidence in the raw data that the distribution of the reservation wage for those eligible for WFTC lies above the distribution for those who are not eligible for WFTC. Differences in the distribution of the duration of unemployment by WFTC eligibility are less transparent, however, in that, at

[8] McKay (2003) analyses the Families and Children Studies for 1999, 2000 and 2001 and reports that awareness of WFTC among low and moderate-income families increased from 33% in 2000 to 42% in 2001, with the rate of take-up amongst families being eligible increasing from 62% in 2000 to 67% in 2001. Awareness amongst eligible non recipients was estimated at 53% relative to 43% awareness amongst those not in work. It is interesting to note that at its peak, Family Credits were paid to approximately 800,000 families, whilst in 2001, the number of families receiving WFTC had reached 1.25 million. Moreover, the introduction of the WFTC had an immediate impact with an increase of almost 150,000 recipients between August 1999 and November 1999 and by over 300,000 between August 1999 and August 2000 (McKay, 2003).

lower (higher) levels of unemployment duration, those eligible for WFTC have a distribution which lies above (below) that of those individuals who are ineligible for WFTC.

With respect to the sample means, there are clear differentials by WFTC eligibility, which are statistically significant. For example, the expected wage and reservation wage both have a higher mean and lower variance for those eligible for WFTC, see Table 1B. Conversely, the duration of unemployment is lower in the raw data for those who are eligible for WFTC. The raw correlations in the data between the reservation wage and unemployment duration, and the reservation wage and the expected wage are shown in Table 1C by WFTC eligibility. Clearly, there is a positive and statistically significant relationship between the reservation wage and expected wage and the magnitude is larger for the sample of individuals who are eligible for WFTC. The inverse relationship between the reservation wage and the duration of the unemployment spell is also heightened for the sample of individuals who are eligible for WFTC.

Given the above findings in the raw data it is interesting to explore whether the key elasticities between the reservation wage and the duration of unemployment differ, once wage expectations are explicitly incorporated into the model, relative to those estimated in the two equation system specification.[9] In order to explore such considerations, we model a system of three equations by three stage least squares using Mundlak fixed effects as follows:

$$\begin{aligned} \log(t)_{it} &= \boldsymbol{X}_{1it}\beta + \gamma \log(rw)_{it} + \bar{\boldsymbol{Z}}_{1i}\pi + \varepsilon_{1it} \\ \log(rw)_{it} &= \boldsymbol{X}_{2it}\phi + \lambda \log(t)_{it} + \tau \log(ew) + \bar{\boldsymbol{Z}}_{2i}\theta + \varepsilon_{2it} \\ \log(ew)_{it} &= \boldsymbol{X}_{3it}\eta + \varphi WFTC_{it} + \bar{\boldsymbol{Z}}_{3i}\alpha + \varepsilon_{3it} \end{aligned} \qquad (3)$$

The vector $\boldsymbol{X}_3$ contains covariates which potentially influence the expected wage of the individual, which are based on the controls which are usually included in a Mincerian wage

[9] In a similar vein, Dolton and O'Neill (1995) explore the extent to which the 'Restart' programme introduced by the UK Government in 1987 reduced the duration of unemployment by influencing individuals' expectations. The Restart programme was a system of 6 monthly meetings between an unemployed individual and a counselor during which advice on benefits, search behaviour and training courses was offered. Their results suggest that Government intervention can reduce the duration of unemployment by increasing the arrival rate of job offers or

equation, see Willis (1986), specifically: gender; ethnicity; marital status; highest level of educational attainment; a quadratic in age; and whether the individual has had previous employment by including their wage level from their last period of employment.

We also condition on WFTC (i.e. WFTC eligibility as described above) in the expected wage equation, which acts as an exclusion restriction to identify the parameters of the reservation wage equation when the expected wage is included as a covariate.[10] The exclusion restrictions used to identify the parameters of the unemployment duration equation are as in equation (2) above. The vector $\bar{\boldsymbol{Z}}_3$ contains the mean of time varying covariates to control for fixed effects, Mundlak (1978). The parameters η and φ capture the influence of variables on the expected wage and measure the elasticity of the expected wage with respect to the introduction of WFTC.

In order to explore the robustness of our findings, we estimate a range of specifications where WFTC is defined in four alternative ways: firstly, as a single binary indicator denoting eligibility for WFTC in any year from 1999 onwards (i.e. 'model 2'); secondly, as three binary controls for eligibility between October 1999 and April 2000 (the period when WFTC was introduced), eligibility between May 2000 and 2001 and eligibility in 2002 (i.e. 'model 3'); thirdly, as eligibility in 1999, i.e. eligibility status at the time of the policy change, entered as a time invariant control from 1999 onwards (i.e. 'model 4'); finally, as three binary indicators each equal to unity if it is the first, second, or third year that the individual has been eligible for WFTC (i.e. 'model 5'). The different specifications allow us to explore the sensitivity of the results to the definition of the exclusion condition in the expected wage equation. For example, it may be the case that the WFTC policy reform may

by making job search more effective but not by altering individual's expectations and their subsequent reservation wages.

[10] Note that part of the eligibility condition for WFTC is based upon hours worked. Since our sample comprises for those individuals not in work, we base this part of the eligibility condition on expected hours of work as well as, where appropriate, the hours worked by his/her spouse.

only be a 'surprise' (i.e. unexpected) for the year of introduction or for the first year that the individual is eligible.

Results

We estimate equation (3) as a system of equations by three stage least squares. The results are shown in Tables 3 and 4 where models 2 and 3 are presented in Table 3 and models 4 and 5 are presented in Table 5.[11] Across the four specifications, the first column presents the unemployment duration equation, the second column presents the reservation wage equation, and the third column presents the expected wage equation. It is apparent that in 'model 2' in Table 3, being eligible for WFTC has a positive and statistically significant influence on the expected wage ($\hat{\varphi}$) – at approximately 5 percentage points.[12] Gender, educational attainment and age act in accordance with the direction of impact that one would expect in a wage equation: to be specific, males and older individuals expect a higher wage as do those with higher levels of educational attainment. In the reservation wage equation, the elasticity of the reservation wage with respect to the expected wage is positive and elastic. Out of the over-identifying instruments in the reservation wage equation, benefit income has a positive impact upon the reservation wage as found by Jones (1988), Gorter and Gorter (1993) and Dolton and O'Neill (1995). For example, a one percent increase in the level of unemployment benefits is associated with a higher reservation wage in the order of 0.4 percentage points. This finding is similar to the upper range found by Addison et al. (2009) for the benefit elasticity across European countries using the non parametric approach of Lancaster and Chesher (1983).

In terms of the key elasticities, $\hat{\gamma}$ and $\hat{\lambda}$, which measure the elasticity of unemployment duration with respect to the reservation wage and the elasticity of the

[11] For brevity, we do not report the parameter estimates of π, θ and α. These results are available on request.
[12] The WFTC control is statistically insignificant if included in the reservation wage equation, thereby endorsing its validity as an over-identifying instrument. In contrast to the positive and statistically significant influence of the 'Restart' programme upon unemployment duration, found by Dolton and O'Neill (1995), there is no direct

reservation wage with respect to unemployment duration, respectively, compared to the estimates found in the two equation system, i.e. 'model 1', incorporating the expected wage into the econometric framework has slightly altered the magnitude of the elasticities. To be specific, there has been a moderate decrease in the elasticity of unemployment duration with respect to the reservation wage from 1.95 to 1.86 and a slight increase in the elasticity of the reservation wage with respect to unemployment duration from -0.84 to -0.81, although the changes are not statistically significant. An increase in the reservation wage by 10 percent reduces the chance of finding employment by around 19 percentage points. This is comparable in magnitude to the estimate of the elasticity of unemployment duration with respect to the reservation wage of 1.8 obtained by Lancaster (1985) in a two equation model.

In 'model 3' we control for WFTC eligibility by including three binary indicators, which denote the year when the individual was eligible for WFTC: arguably if the introduction of WFTC was an unexpected policy shock, its effect may be largest at or near the point of introduction and potentially may dissipate thereafter. Since WFTC were not fully implemented until April 2000, this is potentially when one might expect the influence of the policy change to be the most pronounced. The results shown in Table 3 indeed suggest that this is borne out by the data. To be specific, we find that eligibility for WFTC during the induction phase, i.e. October 1999 to April 2000, has no significant statistical association with the expected wage. The only statistically significant effect relates to eligibility between May 2000 and 2001, which is found to increase the expected wage by 7.2 percentage points. Finally, the specification encapsulated by 'model 3' serves to further moderate the magnitude of the key elasticities $\hat{\gamma}$ and $\hat{\lambda}$. Interestingly, the elasticity of the reservation wage with respect to unemployment duration ($\hat{\lambda}$) is now significantly different from that found in the two equation model adopted in the existing literature, i.e. 'model 1.'

significant influence of WFTC upon unemployment duration when it is included as a covariate in the unemployment duration equation.

In Table 4, the WFTC control is defined as where eligibility in 1999 is entered as a time invariant binary indicator from 1999 onwards. The results suggest that the influence of WFTC eligibility is moderated in comparison to 'model 2' and is only statistically significant at the 10 percent level. This finding is perhaps not surprising given that the results of 'model 3' suggest that WFTC eligibility only has a statistically significant positive impact upon wage expectations when the policy is fully implemented, i.e. May 2000. Again, the key elasiticities in terms of magnitude, sign and elasticity remain unchanged. The final specification that is estimated is 'model 5' where three binary controls are entered which represent the first, second and third years of WFTC eligibility. Whilst the key elasticities between reservation wages and unemployment duration are robust to this alternative definition of controlling for WFTC eligibility, WFTC eligibility only has a statistically significant association with the expected wage during the initial, i.e. first year, of eligibility.

To summarise, the incorporation of expected wages into the econometric framework serves to lower the effect of the reservation wage on the duration of unemployment and serves to moderate the inverse effect of the duration of unemployment on the reservation wage. However, with the exception of one specification, the differentials are statistically insignificant when compared to the two equation approach. It is interesting to note that once the period of WFTC eligibility is explicitly taken into account, the extent to which the elasticity of the reservation wage with respect to unemployment duration ($\hat{\lambda}$) becomes smaller in magnitude, i.e. more inelastic, is statistically significant as compared to the two equation model.[13]

[13] Over the period of study, i.e. prior to 1999, it is possible that individuals were eligible to receive Family Credits (FC), the benefit system which preceded WFTC. To be eligible for FC, individuals needed to have one adult in the family working 16 hours or more a week and a dependent child. If we include a binary control for whether the individual was entitled to FC between 1996 and October 1999, we find that the key elasticities remain unaffected by conditioning on FC eligibility (those eligible for WFTC have around a 5 percentage point higher expected wage).

V. Conclusion

In this paper, we have extended the structural model of Jones (1988) to incorporate the role of expected wages. Although the expected wage plays an important role in theoretical models of job search and labour market participation, to the authors' knowledge, this is the first paper to explicitly incorporate the expected wage into an empirical framework, which jointly models the length of unemployment duration (in the context of incomplete spells), the reservation wage and the expected wage. As such, we make an important contribution to the existing empirical literature in this area. In our econometric framework, an exogenous policy shock, i.e. the introduction of WFTC, is allowed to influence the expected net income distribution, which in turn influences the reservation wage and hence the duration of not being in work.

Our empirical results suggest that the introduction of WFTC had a positive influence on expected wages, which in turn were positively associated with reservation wages. In addition, we find that the magnitude of the elasticity of unemployment duration with respect to the reservation wage and the elasticity of the reservation wage with respect to unemployment duration are both reduced in absolute terms relative to the corresponding elasticities estimated in the two equation model, which does not explicitly incorporate wage expectations. However, with the exception of one specification, the differentials in the key elasticities across the two equation and three equation models are not statistically significant. The effect of incorporating wage expectations only has a significant effect upon the differentials in the key elasticities when we explicitly take into account the period of WFTC eligibility. To be specific, the results suggest that the sensitivity of reservation wages with respect to unemployment duration becomes considerably less elastic, changing from -0.84 ('model 1') to -0.33 ('model 3'). Such a finding is consistent with individuals becoming more informed about labour market conditions once wage expectations and the 'surprise' element of the introduction of WFTC are taken into account.

Our empirical findings highlight the importance of incorporating wage expectations in the analysis of the behaviour and decision-making of those individuals who are not in work, as well as contributing more generally to the sparse, yet growing, empirical literature exploring the role and implications of expectations at the individual and household level. Moreover, given the influence of wage expectations on reservation wages, it is apparent that policy-makers may be able to influence the reservation wages of those out of work by focusing on the determinants of expected wages. For example, the role of Government agencies such as Job Centre Plus in the UK, which support people of working age from welfare into work and aid employers in filling vacancies, in disseminating advice and information to those out of work, may serve to not only help make job search more effective, with the aim of increasing the arrival rate of job offers, but also to help to shape the wage expectations of the unemployed. It is apparent that understanding the eligibility and operation of tax credit systems can be daunting for those out of work. Given that such aspects of the tax system are primarily designed to encourage those on benefits into the labour market via altering take-home wages, an important, if not essential, part of the process is to help to inform those out of work about the operation of tax credits in order to influence their wage expectations and thereby to encourage labour market participation.

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Figure 1: The Distribution of the Log Reservation Wage, 1996 to 2002

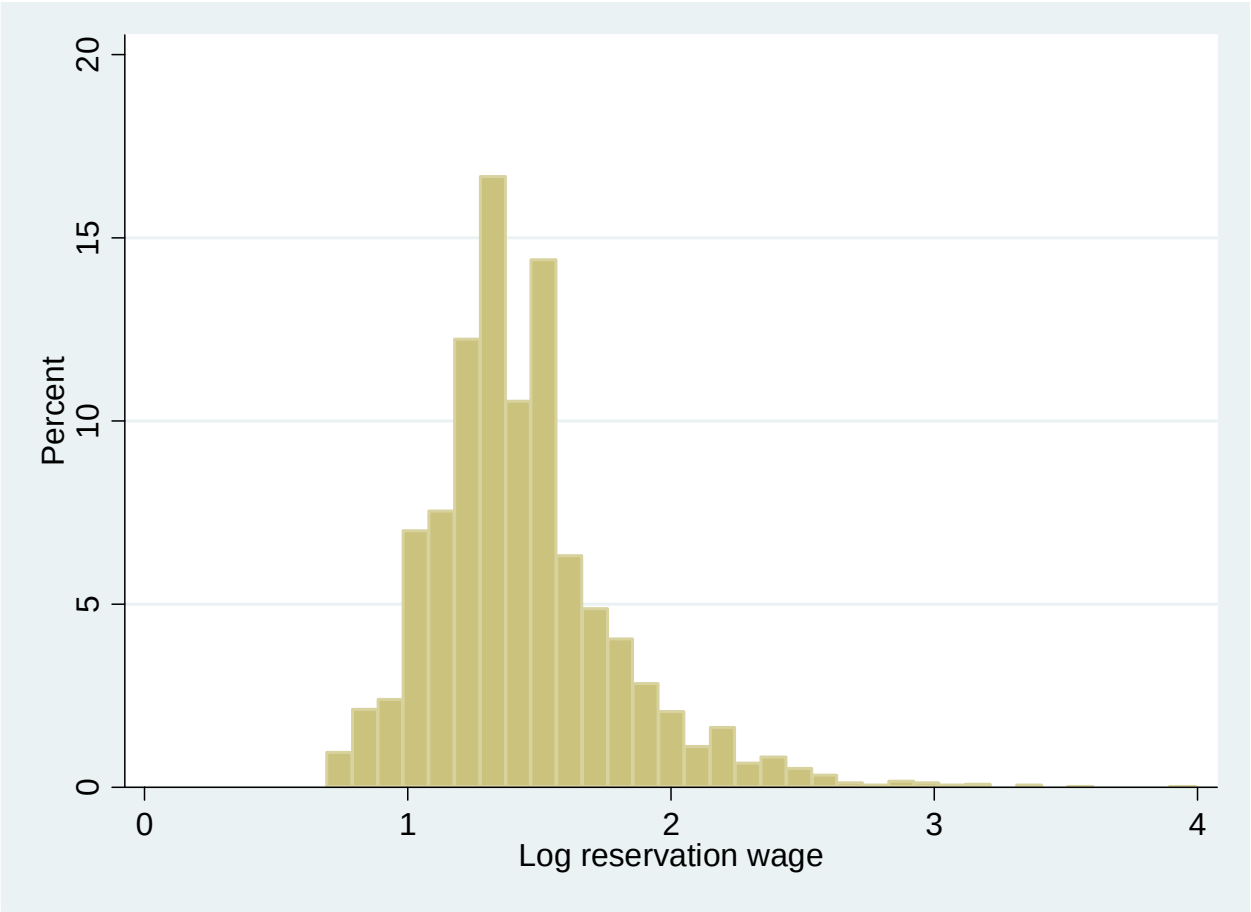

Figure 2: The Distribution of the Log Expected Wage, 1996 to 2002

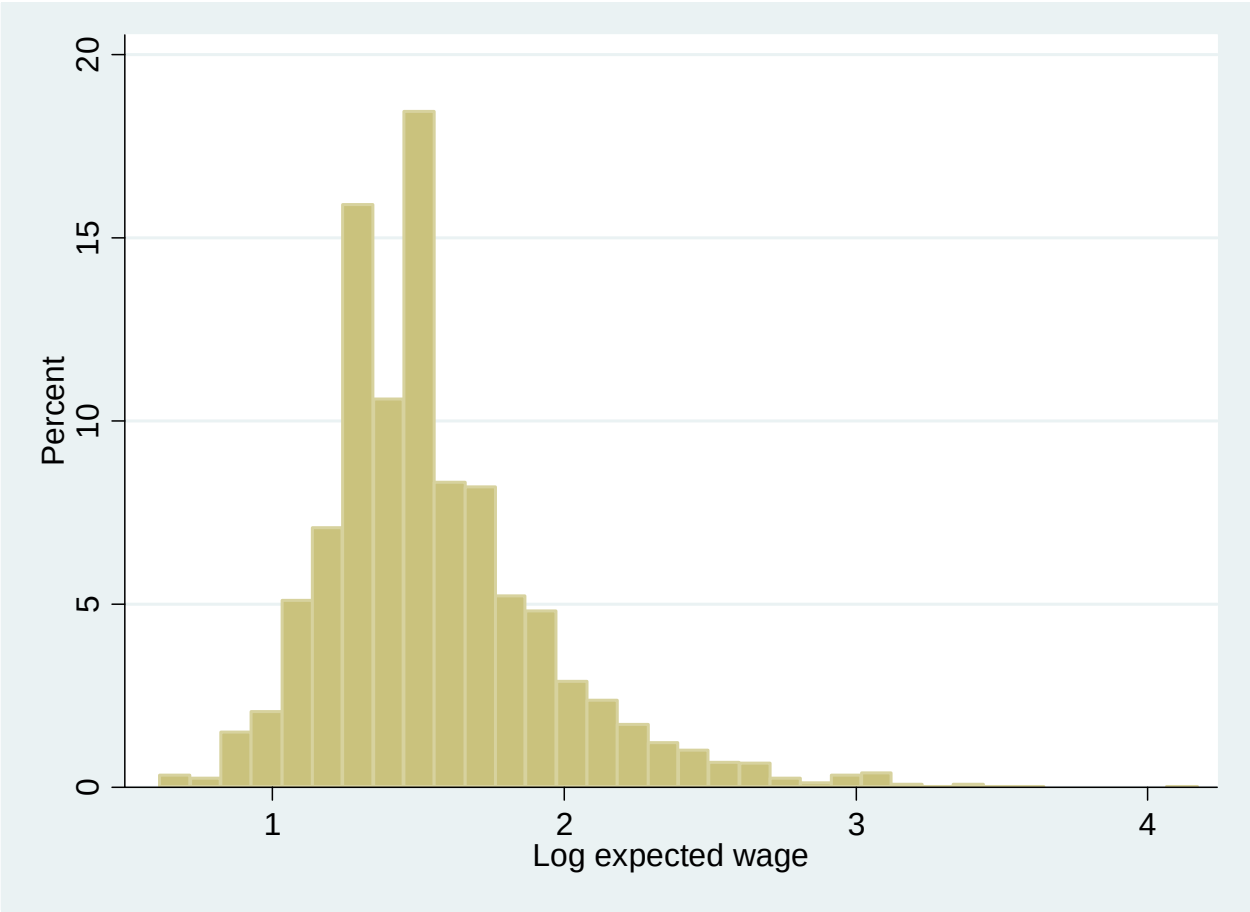

Figure 3: The Distribution of the Log Number of Days Currently Not in Work, 1996 to 2002

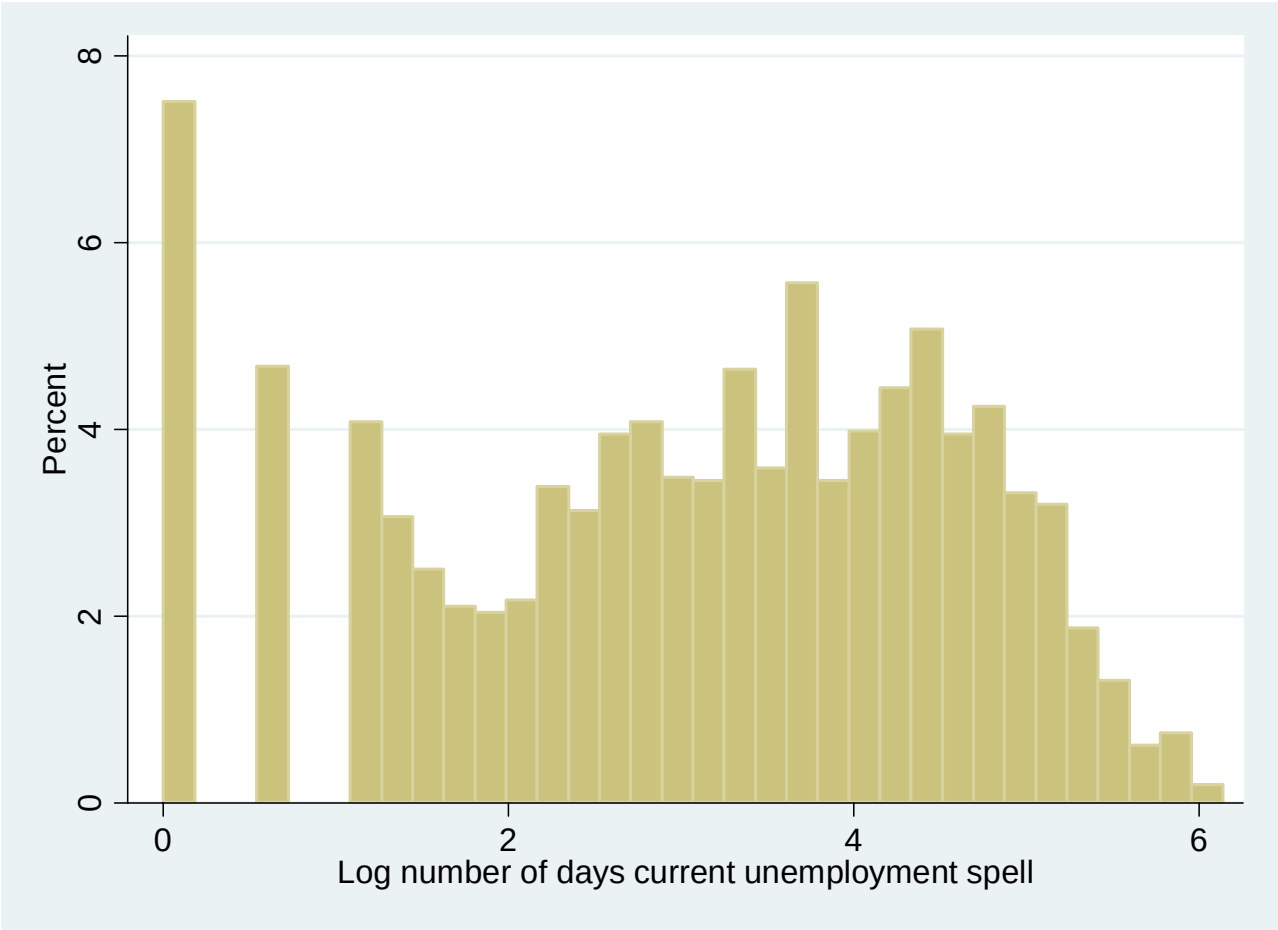

Figure 4: Density Plot of the Log Expected Wage by WFTC Eligibility

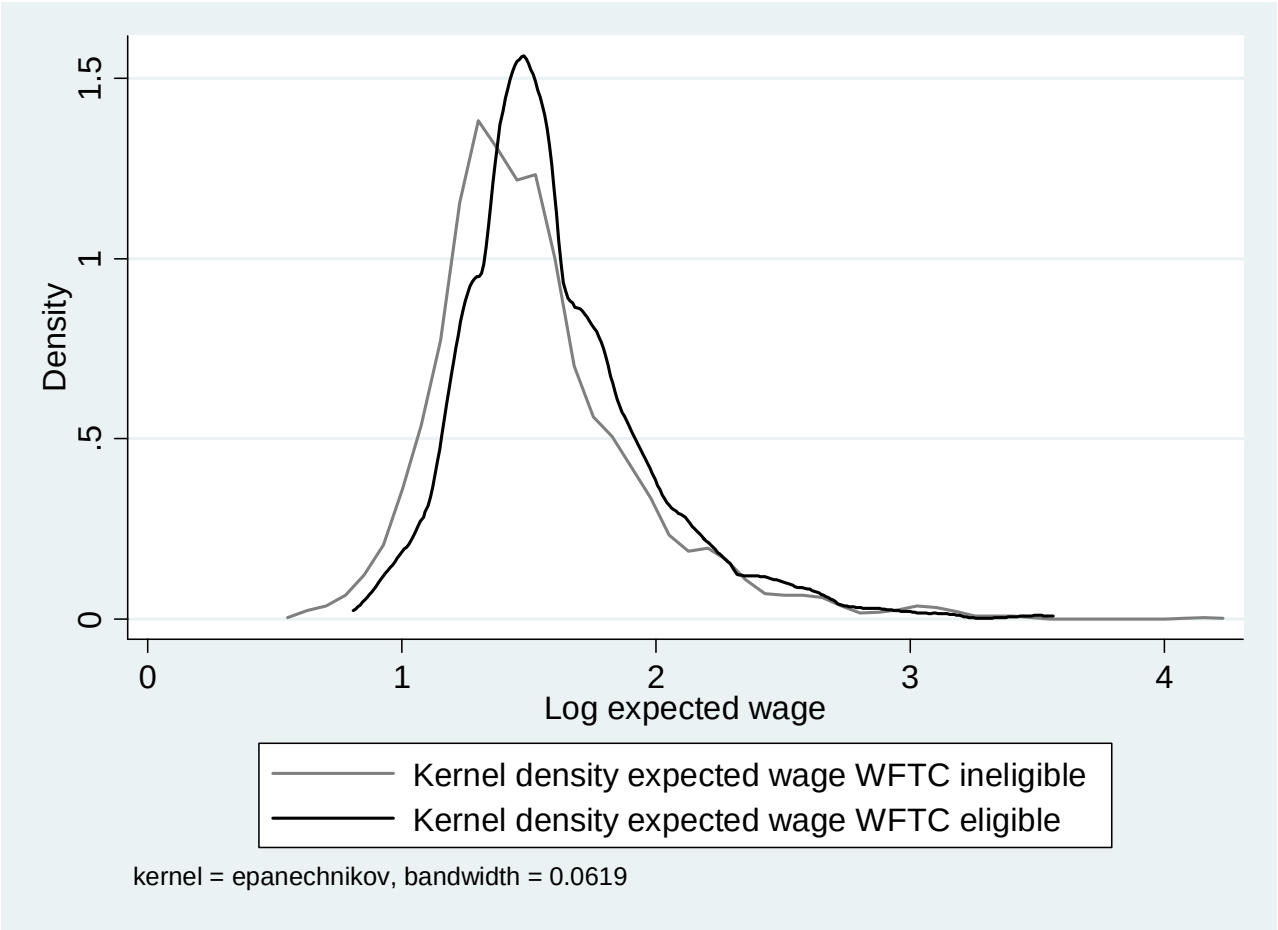

Figure 5: Density Plot of the Log Reservation Wage by WFTC Eligibility

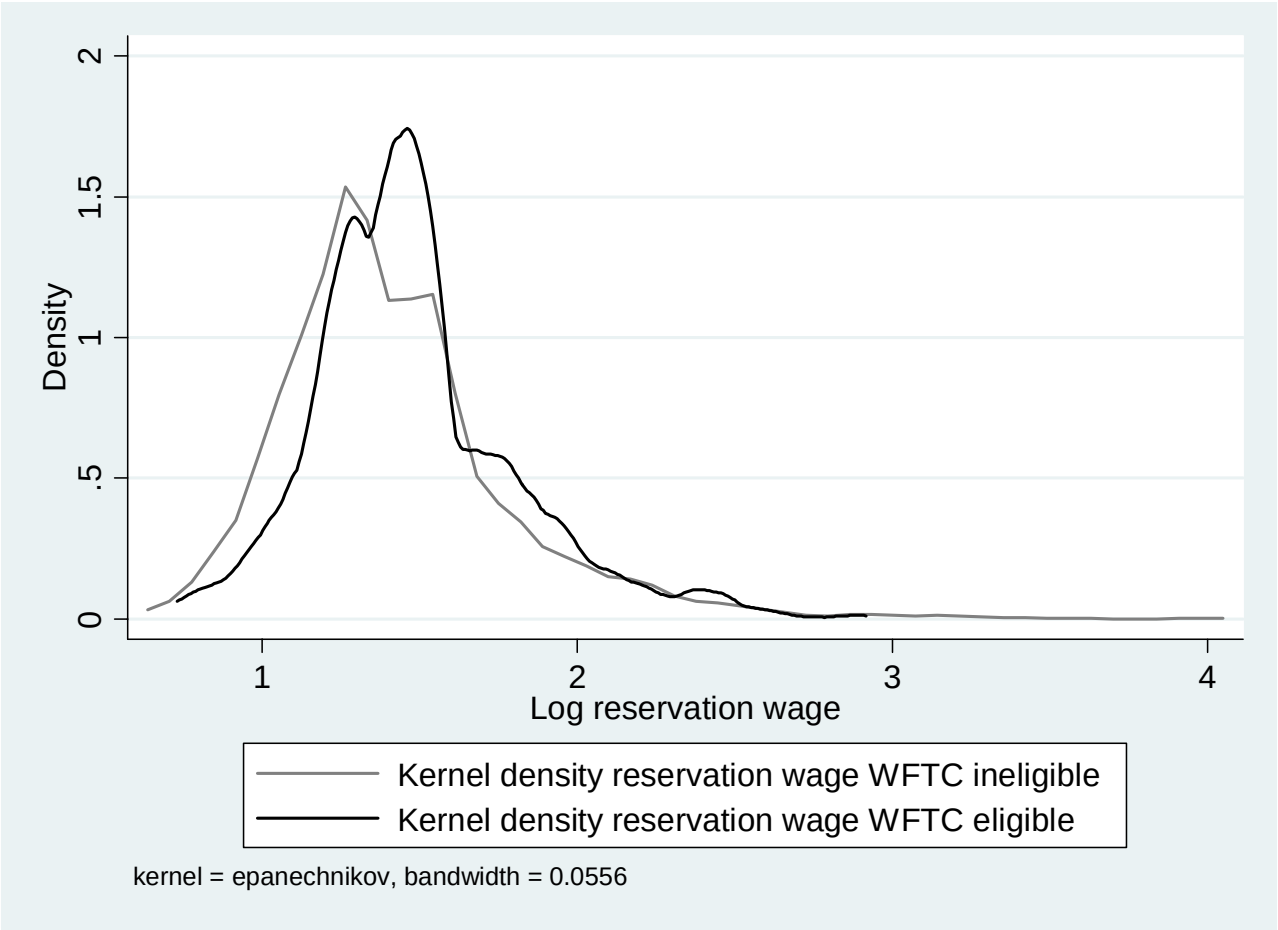

Figure 6: Density Plot of the Log Duration of Unemployment by WFTC Eligibility

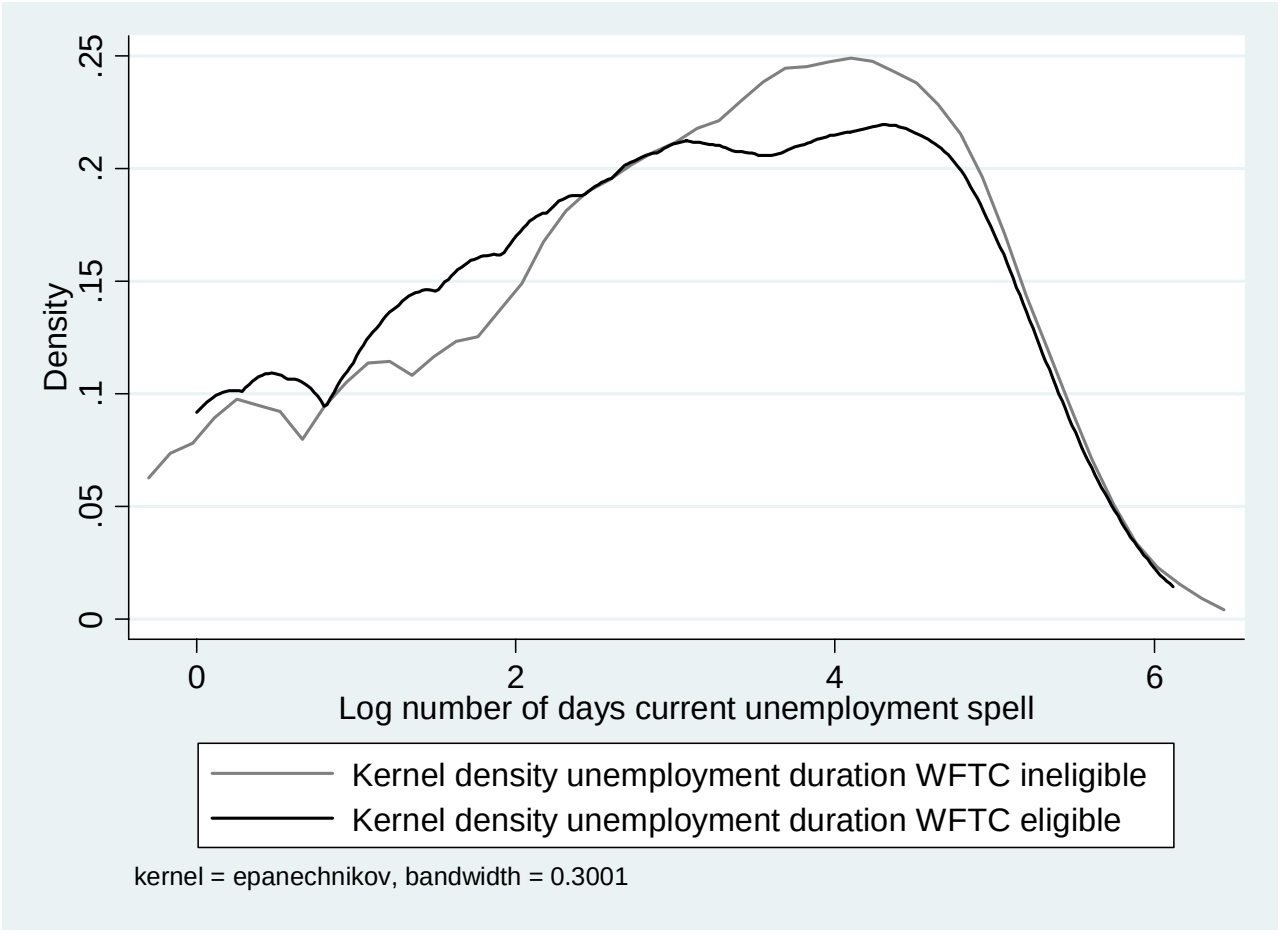

Table 1A: Summary Statistics

	MEAN	STD. DEV	MIN	MAX
Log Unemployment Duration	3.041	1.555	0	6.136
Log Reservation Wage	1.438	0.356	0.613	3.992
Log Expected Wage	1.549	0.389	0.693	4.169
Male	0.406	0.491	0	1
White	0.818	0.386	0	1
Married/Co-habiting	0.680	0.467	0	1
Degree	0.069	0.253	0	1
A Level	0.116	0.321	0	1
GCSE	0.220	0.414	0	1
Teaching/Nursing Qualification	0.187	0.390	0	1
Regional Unemployment (UE) Rate	5.976	1.590	3.3	11.1
Age	37.531	11.609	16	65
Unemployed	0.380	0.486	0	1
Job Search Index	0.835	1.139	0	3
Log UE Benefits	1.377	1.012	0	3.765
Log Other Benefits	4.045	1.992	0	7.233
Log Pay Last Job	2.013	3.036	0	9.392
Working Spouse	0.383	0.486	0	1
No of Children Aged <16	1.074	1.172	0	7
No of Dependent Children, Aged 16-19	0.061	0.257	0	3
WFTC: Eligible	0.302	0.459	0	1
WFTC: Eligible Oct 1999 – Apr 2000	0.193	0.395	0	1
WFTC: Eligible May 2000 – 2001	0.115	0.319	0	1
WFTC: Eligible 2002	0.093	0.291	0	1
WFTC: 1999 Eligibility	0.157	0.364	0	1
WFTC: 1st year Eligible	0.265	0.442	0	1
WFTC: 2nd year Eligible	0.047	0.212	0	1
WFTC: 3rd year Eligible	0.012	0.108	0	1
Observations		3,034		

Table 1B: Mean and Standard Deviation of Log Unemployment Duration, Log Reservation Wage and Log Expected Wage by WFTC Eligibility

	INELIGIBLE WFTC		**ELIGIBLE WFTC**	
	MEAN	STD. DEV	MEAN	STD. DEV
Log Unemployment Duration	3.090	1.543	2.926	1.579
Log Reservation Wage	1.419	0.368	1.482	0.323
Log Expected Wage	1.525	0.395	1.605	0.368
Observations	2,118		916	

Table 1C: Correlations between Log Unemployment Duration and Log Reservation Wage and between Log Reservation Wage and Log Expected Wage by WFTC Eligibility

INELIGIBLE WFTC		**ELIGIBLE WFTC**	
	RESERVATION WAGE		RESERVATION WAGE
EXPECTED WAGE	0.8220 *p=[0.000]*	EXPECTED WAGE	0.8363 *p=0.000]*
	RESERVATION WAGE		RESERVATION WAGE
UNEMPLOYMENT DURATION	-0.0434 *p=[0.046]*	UNEMPLOYMENT DURATION	-0.1066 *p=[0.000]*

Table 2: 2SLS Model of Unemployment Duration and the Reservation Wage

	MODEL 1			
	DURATION		**RES. WAGE**	
	COEF	TSTAT	COEF	TSTAT
Log Unemployment Duration	–	–	-0.836	*(2.46)*
Log Reservation Wage	1.948	*(2.97)*	–	–
Male	0.028	*(0.45)*	0.089	*(4.24)*
White	0.030	*(0.57)*	-0.035	*(1.14)*
Married/Co-habiting	0.424	*(2.09)*	-0.230	*(2.92)*
Degree	-2.083	*(2.14)*	1.518	*(3.29)*
A Level	-0.871	*(1.41)*	0.655	*(2.44)*
GCSE	0.079	*(0.16)*	0.165	*(1.02)*
Teaching/Nursing	0.071	*(0.16)*	0.051	*(0.39)*
Regional UE Rate	0.053	*(1.61)*	-0.012	*(1.95)*
Age	0.079	*(5.45)*	0.011	*(2.15)*
Age Squared	-0.001	*(4.08)*	-0.001	*(1.88)*
Unemployed	-0.200	*(1.41)*	1.498	*(1.52)*
Job Search	-0.154	*(4.00)*	0.001	*(0.07)*
Log UE Benefits	–	–	-0.327	*(1.84)*
Log Other Benefits	–	–	-0.065	*(1.83)*
Log Pay Last Job	–	–	0.080	*(2.39)*
Working Spouse	–	–	-0.025	*(1.25)*
No of Children Aged <16	–	–	0.023	*(2.74)*
No of Dependent Children, Aged 16-19	–	–	-0.015	*(0.27)*
CONTROLS	Region, year, month of interview			
Chi Squared *[p value]*	1,128.33	*[0.000]*	532.47	*[0.000]*
Observations	3,034			

Table 3: 3SLS Model of Unemployment Duration, Reservation Wages and Expected Wages

	MODEL 2						MODEL 3					
	DURATION		**RES. WAGE**		**EXP. WAGE**		**DURATION**		**RES. WAGE**		**EXP. WAGE**	
	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
Log Unemployment Duration	–	–	-0.805	*(3.68)*	–	–	–	–	-0.327	*(2.36)*	–	–
Log Reservation Wage	1.858	*(2.94)*	–	–	–	–	1.819	*(1.95)*	–	–	–	–
Log Expected Wage	–	–	1.479	*(5.34)*	–	–	–	–	1.493	*(9.71)*	–	–
WFTC: Eligible	–	–	–	–	0.047	*(3.18)*	–	–	–	–	–	–
WFTC: Eligible Oct1999-Apr2000	–	–	–	–	–	–	–	–	–	–	0.014	*(0.86)*
WFTC: Eligible May 2000-2001	–	–	–	–	–	–	–	–	–	–	0.072	*(3.56)*
WFTC: Eligible 2002	–	–	–	–	–	–	–	–	–	–	0.025	*(0.90)*
Male	0.123	*(2.00)*	-0.045	*(2.76)*	0.126	*(9.29)*	0.124	*(2.01)*	-0.056	*(4.53)*	0.124	*(9.19)*
White	0.008	*(0.12)*	0.038	*(1.60)*	-0.041	*(2.36)*	0.005	*(0.08)*	0.051	*(2.75)*	-0.055	*(2.55)*
Married/Co-habiting	0.405	*(2.01)*	0.166	*(2.83)*	-0.100	*(2.11)*	0.403	*(2.01)*	0.098	*(2.29)*	-0.101	*(2.14)*
Degree	-2.143	*(2.23)*	-0.937	*(2.94)*	0.413	*(2.14)*	-2.112	*(2.22)*	-0.395	*(1.81)*	0.398	*(2.06)*
A Level	-0.914	*(1.48)*	-0.416	*(2.16)*	0.130	*(0.88)*	-0.908	*(1.48)*	-0.135	*(0.98)*	0.116	*(0.79)*
GCSE	0.100	*(0.20)*	-0.166	*(1.30)*	0.116	*(0.92)*	0.104	*(0.21)*	-0.112	*(1.15)*	0.102	*(0.81)*
Teaching/Nursing	-0.004	*(0.01)*	-0.064	*(0.62)*	0.106	*(1.01)*	0.001	*(0.01)*	-0.065	*(0.82)*	0.091	*(0.87)*
Regional UE Rate	0.026	*(0.78)*	0.016	*(3.17)*	–	–	0.025	*(0.76)*	0.014	*(3.61)*	–	–
Age	0.101	*(6.97)*	-0.001	*(0.18)*	0.024	*(6.63)*	0.101	*(7.02)*	-0.006	*(2.10)*	0.024	*(6.65)*
Age Squared	-0.001	*(5.40)*	0.001	*(0.46)*	-0.001	*(5.65)*	-0.001	*(5.44)*	0.001	*(1.94)*	-0.001	*(5.65)*
Unemployed	-0.182	*(1.29)*	-1.810	*(2.75)*	–	–	-0.183	*(1.30)*	-0.667	*(1.52)*	–	–
Job Search	-0.161	*(4.19)*	-0.009	*(0.97)*	–	–	-0.161	*(4.22)*	-0.004	*(0.60)*	–	–
Log UE Benefits	–	–	0.414	*(2.71)*	–	–	–	–	0.156	*(1.53)*	–	–
Log Other Benefits	–	–	0.009	*(3.53)*	–	–	–	–	0.038	*(2.53)*	–	–
Log Pay Last Job	–	–	0.077	*(3.56)*	0.004	*(2.09)*	–	–	0.034	*(2.48)*	0.005	*(2.20)*
Working Spouse	–	–	0.005	*(0.36)*	–	–	–	–	0.003	*(0.26)*	–	–
No of Children Aged <16	–	–	0.004	*(0.63)*	–	–	–	–	0.001	*(0.32)*	–	–
No of Dependent Children, 16-19	–	–	0.016	*(0.39)*	–	–	–	–	-0.001	*(0.01)*	–	–
CONTROLS	Region, year, month of interview											
Chi Squared [*p value*]	1,067.53	*[0.000]*	5,209.43	*[0.000]*	754.70	*[0.000]*	1,069.93	*[0.000]*	9,659.67	*[0.000]*	742.86	*[0.000]*
Observations	3,034											

Table 4: 3SLS Model of Unemployment Duration, Reservation Wages and Expected Wages

	MODEL 4						MODEL 5					
	DURATION		**RES. WAGE**		**EXP. WAGE**		**DURATION**		**RES. WAGE**		**EXP. WAGE**	
	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
Log Unemployment Duration	–	–	-0.611	*(3.43)*	–	–	–	–	-0.517	*(3.52)*	–	–
Log Reservation Wage	1.891	*(1.97)*	–	–	–	–	1.841	*(1.93)*	–	–	–	–
Log Expected Wage	–	–	1.486	*(7.27)*	–	–	–	–	1.488	*(8.62)*	–	–
WFTC: 1999 Eligibility	–	–	–	–	0.014	*(1.78)*	–	–	–	–	–	–
WFTC: 1st year Eligible	–	–	–	–	–	–	–	–	–	–	0.046	*(3.11)*
WFTC: 2nd year Eligible	–	–	–	–	–	–	–	–	–	–	0.051	*(1.71)*
WFTC: 3rd year Eligible	–	–	–	–	–	–	–	–	–	–	0.017	*(0.31)*
Male	0.124	*(2.00)*	-0.051	*(3.46)*	0.129	*(9.52)*	0.124	*(2.00)*	-0.052	*(3.91)*	0.126	*(9.30)*
White	0.008	*(0.12)*	0.047	*(2.20)*	-0.057	*(3.43)*	0.007	*(0.11)*	0.044	*(2.23)*	-0.043	*(2.41)*
Married/Co-habiting	0.408	*(2.02)*	0.139	*(2.68)*	-0.098	*(2.08)*	0.404	*(2.00)*	0.124	*(2.93)*	-0.099	*(2.10)*
Degree	-2.165	*(2.25)*	-0.730	*(2.69)*	0.446	*(2.31)*	-2.131	*(2.21)*	-0.615	*(2.64)*	0.413	*(2.14)*
A Level	-0.924	*(1.50)*	-0.308	*(1.83)*	0.140	*(0.95)*	-0.912	*(1.48)*	-0.249	*(1.69)*	0.127	*(0.86)*
GCSE	0.099	*(0.20)*	-0.148	*(1.28)*	0.124	*(0.98)*	0.102	*(0.20)*	-0.137	*(1.31)*	0.116	*(0.92)*
Teaching/Nursing	-0.011	*(0.02)*	-0.072	*(0.77)*	0.130	*(1.25)*	-0.003	*(0.01)*	-0.068	*(0.80)*	0.106	*(1.02)*
Regional UE Rate	0.025	*(0.76)*	0.015	*(3.31)*	–	–	0.025	*(0.75)*	0.015	*(3.58)*	–	–
Age	0.101	*(6.98)*	-0.003	*(0.80)*	0.025	*(6.73)*	0.101	*(6.98)*	-0.003	*(1.39)*	0.024	*(6.62)*
Age Squared	-0.001	*(5.40)*	0.001	*(0.95)*	-0.001	*(5.75)*	-0.001	*(5.40)*	0.001	*(1.41)*	-0.001	*(5.65)*
Unemployed	-0.181	*(1.28)*	-1.335	*(2.40)*	–	–	-0.183	*(1.30)*	-1.126	*(2.38)*	–	–
Job Search	-0.160	*(4.18)*	-0.007	*(0.90)*	–	–	-0.161	*(4.19)*	-0.005	*(0.72)*	–	–
Log UE Benefits	–	–	0.307	*(2.37)*	–	–	–	–	0.260	*(2.36)*	–	–
Log Other Benefits	–	–	0.064	*(3.33)*	–	–	–	–	0.056	*(3.48)*	–	–
Log Pay Last Job	–	–	0.059	*(3.36)*	0.005	*(2.30)*	–	–	0.051	*(3.52)*	0.005	*(2.12)*
Working Spouse	–	–	0.004	*(0.29)*	–	–	–	–	0.004	*(0.32)*	–	–
No of Children Aged <16	–	–	0.003	*(0.52)*	–	–	–	–	0.002	*(0.50)*	–	–
No Dependent Children, 16-19	–	–	0.009	*(0.26)*	–	–	–	–	0.006	*(0.19)*	–	–
CONTROLS	Region, year, month of interview											
Chi Squared [*p value*]	1,065.84	*[0.000]*	6,413.58	*[0.000]*	736.52	*[0.000]*	1,064.35	*[0.000]*	7,970.17	*[0.000]*	744.87	*[0.000]*
Observations	3,034											