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THE IMPACT OF RESTART ON RESERVATION WAGES AND LONG-TERM UNEMPLOYMENT†

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1. INTRODUCTION

The last two decades have seen considerable growth in the level of unemployment in the UK. Between 1960 and 1968, the average unemployment rate was 2.6 percent, by the first half of the 1980's this had risen to 10.5 percent. Along with rising unemployment, this period also saw changes in the nature of unemployment, with unemployed individuals spending longer periods out of work. Between 1979 and 1986 the proportion of unemployed people who had been out of work for over a year rose from 20 percent to approximately 40 percent. Recent work by Layard *et al.* (1991) shows that almost the entire growth in unemployment over this period can be attributed to an increase in time spent unemployed rather than an increase in the inflow rate into unemployment.

In this paper we examine the factors associated with long-term unemployment. In particular, we analyse the impact of unemployment benefits and reservation wages on unemployment duration, in the context of an optimal search model, making use of the procedures developed by Lancaster and Chesher (1983, 1984). Our data also enable us to examine the extent to which the government's Restart programme, introduced in 1987, succeeded in reducing unemployment duration by altering individual's expectations. Our results support the predictions of the job search model, in that higher levels of both unemployment benefits and reservation wages significantly increase time spent unemployed. Furthermore, we show that government intervention can lead to substantial reductions in unemployment duration. However, our results suggest that this is achieved either through altering the demand side of the economy (increasing the arrival rate of job offers) or on the supply side, by making individual search more effective, but not as a

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result of altering individual expectations and subsequent reservation wages. Our results suggest that the long-term unemployed have realistic expectations of the wage they can expect to receive upon working. In particular, the reservation wages quoted are approximately equal to the lowest wage necessary to ensure a small positive payoff to working. Thus, while government intervention may affect demand side conditions or alter individual search intensity, it has little scope for reducing unemployment duration through reductions in the reservation wage.

In the next section of the paper we discuss the optimal search model upon which our empirical results are based. We also discuss the non-parametric derivation of the structural parameters of such a model following Lancaster and Chesher (1983). In Section III we describe the data we use in detail, paying particular attention to the controlled experiment on the Restart programme. The data contain information on key variables such as unemployment duration, reservation wages, expected wages and benefit levels which enable us to provide estimates of the effect of the government's Restart policy. Section IV presents the estimates of the structural parameters obtained using the nonparametric approach developed by Lancaster and Chesher (1983). Section V uses a parametric approach to estimate the search model. This approach allows us to control for the potential endogeneity of the reservation wage and also examine the impact of an array of personal characteristics on both the reservation wage and unemployment duration. We conclude with some remarks concerning the implications of our findings for labour market policy.

II THE SEARCH THEORY FRAMEWORK FOR EXIT FROM UNEMPLOYMENT

In this section we briefly outline the standard model of optimal job search. In particular we assume that risk neutral agents receive job offers according to a Poisson process with arrival rate λ. Such offers can be viewed as random drawings from a known wage offer distribution with distribution function $F(w)$. On receiving an offer w, an individual has to decide whether to accept that offer and earn w forever, or reject the offer and search for a better offer next period. While searching the individual may receive non-labour income in the form of a benefit level, b. Let V_u denote the value of search during the next period, i.e. the present value of future net income given that the optimal strategy will be pursued in the future and V_w the present value of stopping, accepting the offer and working forever at that wage.[1] Assuming stationarity,

[1] It is straightforward to allow for job loss, with probability say, s, in a given period in this model. However, the inclusion of job loss in this fashion does not alter the basic results presented below (see Lynch (1983)). This model, however, makes no attempt to model on-the-job search. If we allow the worker to engage in costless search while working, then $\xi = b$ and the elasticity of the reservation wage with respect to the benefit level becomes 1. For a more detailed discussion of this see Mortensen (1986), pp. 869–77.

i.e. λ and $F(w)$ independent of time, we can characterize the problem in terms of the following equation:

$$(\lambda+\rho)V_u = b + \lambda E \max[V_u, V_w] \tag{1}$$

where ρ is the individual's discount rate. For an individual faced with the above problem the optimal strategy is to choose a reservation wage ξ, such that the individual will accept the first wage offer greater than or equal to ξ. It can be easily shown that this reservation wage satisfies the following condition:

$$\xi = b + \left(\frac{\lambda}{\rho}\right)\int_{\xi}^{\infty}(w-\xi)\,dF(w) \tag{2}$$

The rate at which individuals escape unemployment is simply:

$$h = \lambda[1-F(\xi)] \tag{3}$$

From equation (3) we see that the probability of exiting unemployment depends on the rate at which job offers arrive and the probability that an individual will accept this offer, which in turn is a function of the reservation wage. It can be shown that under certain regularity conditions: a reduction in b, a reduction in ξ or an increase in λ will all lead to an increase in the probability of exiting from unemployment (Van Den Berg, 1994).

Lancaster and Chesher (1983) have also shown that by differentiating both the reservation wage given by (2) and the hazard function given in (3) with respect to b and λ, one can obtain estimates of the responsiveness of the reservation wages and reemployment probability to changes in the offer arrival rate and the level of unemployment benefits. The advantage of this approach is that by combining the restrictions implied by the optimal job search model with information on reservation wages and expected wages we can deduce many of the structural parameters of the model without specifying the nature of the unknown wage offer distribution. The procedure also allows us to compare the magnitudes of the estimates obtained in this fashion, with those obtained using the more standard parametric procedures adopted later in the paper.

Using the restrictions embodied in the reservation equation (2), Lancaster and Chesher show that the elasticities of the reservation wage with respect to the benefit level and the arrival rate of offers can be written as:

$$\frac{d\log\xi}{d\log b} = \frac{b}{\xi}\frac{(x-\xi)}{(x-b)} \tag{4}$$

and

$$\frac{d\log\xi}{d\log\lambda} = \frac{(\xi-b)}{\xi}\frac{(x-\xi)}{(x-b)} \tag{5}$$

where b, λ and ξ are as defined above and x is the expected wage given that this wage is accepted (i.e. $E[w|w \geq \xi]$).

Using these equations and information on b, x and ξ we can determine the extent to which the reservation wage is affected by changes in the benefit level and the offer arrival rate. In order to determine the impact of these variables on the hazard rate h (the probability of leaving unemployment given that a job has not yet been found) we need to specify a form for the wage offer distribution. Again Lancaster and Chesher show that if one adopts the Pareto Distribution then the elasticities can be written as

$$\frac{\text{dlog}\, h}{\text{dlog}\, b} = -\frac{b}{\xi}\frac{x}{(x-b)} \tag{6}$$

and

$$\frac{\text{dlog}\, h}{\text{dlog}\, \lambda} = \frac{\text{dlog}\, \xi}{\text{dlog}\, b} \tag{7}$$

To examine the robustness of our estimates to the Pareto assumption we also estimate these last two elasticities assuming that the wage offer distribution has an exponential rather than Pareto distribution. Under the exponential assumption it can be shown that:

$$\frac{\text{dlog}\, h}{\text{dlog}\, b} = -\frac{b}{(x-b)} \tag{8}$$

and

$$\frac{\text{dlog}\, h}{\text{dlog}\, \lambda} = \frac{(x-\xi)}{(x-b)} \tag{9}$$

We can calculate the above elasticities for each individual using that individual's value of b, ξ and x. The results we report represent the mean values of these elasticities across individuals.[2]

III. DATA

In April 1987 the government introduced the Restart programme, which was a system of six-monthly meetings between the unemployed individual and a counsellor, with the first meeting taking place when the individual had reached their sixth month of unemployment. The aim of the programme was

[2]We have also computed these elasticities by taking the mean values of b, ξ and x, for the sample first and then applying the formula. This is the method used by Lancaster and Chesher. Our results are not sensitive to this method of calculation.

to review the position of people experiencing long-term unemployment. During the interview the Restart counsellor assessed the claimant's recent unemployment history and offered advice on benefits, search behaviour, training courses and in a minority of cases initiated direct contact with employers. The goal of the Restart process was to reduce the amount of time spent in unemployment and also reduce claims of unemployment benefit by those who did not satisfy the eligibility requirement (i.e. that they be available and actively seeking work). Attendance at the Restart interview was mandatory in that failure to do so could result in benefits being reduced or suspended.

In 1989 the Policy Studies Institute (PSI) were commissioned by the Employment Service (ES) to evaluate the impact of Restart. To do this they identified the sample of individuals approaching their sixth month of unemployment in the period March–July 1989. A random sample of 8,925 of these individuals was chosen to take part in the study. Every ES office in Britain was contacted in order to eliminate regional biases and provide a nationally representative sample. Individuals were selected into the sample on the basis of their National Insurance (NI) numbers. Of this set a control group of 582 people was randomly selected, again based on NI digit sequences. Members of the control group, although eligible for the interview were not asked to attend the initial Restart interview. It is the existence of this control group which allows us to examine the extent to which government intervention, in the form of Restart, altered people's pattern of unemployment and in particular the extent to which expectations and reservation wages changed as a result of the Restart process.

About six months after the initial Restart interview, the survey organization, Social and Community Planning Research, conducted a survey of these same individuals in which detailed information was obtained on subsequent work history, personal characteristics, the Restart interview, previous employment history, job search behaviour and benefit income. Of the original sample, 5,200 individuals completed this survey, which was conducted between September and October 1989.[3]

The structure of the sample was such that it could be linked to administrative data collected by the Department of Employment. Of particular relevance for our study is the fact that individuals in the sample could be linked to the Department's JUVOS data, which records the unemployment history of individuals on a monthly basis dating back to January 1982. JUVOS thus provides us with accurate administrative records on claimants unemployment history, while also allowing us to control for the individual's unemployment experiences in spells preceding the current spell. The survey

[3]Although the issue of attrition arises with the survey data, estimates of a probit equation determining survey participation show that the decision to participate in the survey was independent of control group status. As a result the examination of the impact of Restart is unaffected by the attrition.

also contained information on the individual's travel to work area, which was matched with the National Online Manpower Information System to obtain monthly data on local labour market conditions. These data are used to condition out local demand conditions from our analysis. Summary statistics for the variables used in this study are presented in Table 1 of the Appendix. The results are reported by control group status and clearly indicate the random nature of the assignment.

As is evident from the model discussed in Section II, nonparametric estimation of the structural parameters requires information on the individual's level of benefits b, reservation wage ξ and expected wage x. To calculate benefit levels we use individual responses to a survey question concerning benefits. In the survey each individual was asked to state whether they or their partner were currently receiving benefits and if so to state their current level of benefits by type, i.e. Income support, Unemployment Benefit, Family Credit or Housing Benefit. In the UK welfare system, the most important of these sources of benefits are Unemployment Benefit and Income Support. Unemployment Benefit is a contributory insurance scheme available to everyone aged between 16 and 65. While working, individuals pay National Insurance contributions which go into the National Insurance fund which is then used to pay Unemployment Benefit when the individual becomes unemployed. Unemployment benefits can then be paid for up to 312 days (a year not counting Sundays) in any period of unemployment. In April 1989 the standard weekly rate of benefit was £34.70. Income Support on the other hand is a non-contributory means tested benefit payable to anyone 18 or over (and in special cases 16) who has left school and is not in remunerative work where his or her income and capital are insufficient to meet their day to day living expenses. To claim Income Support an individual must be available for and actively seeking employment. In 1989 the standard rate for a single individual aged over 25 was £34.90.

Rather than use actual benefits as reported by the individual as our measure of welfare receipts we used these reported values combined with the individual's characteristics to estimate benefit entitlement. The use of individual characteristics to instrument the benefit level overcomes a potential self-selection problem which may arise when using actual reported benefits, in that individuals who reported receiving benefits at the time of the survey (approximately 12 months after the spell began) are unlikely to be a random sample of the population. The regression specification and results from this procedure are given in Table A2 of the Appendix[4] and confirm prior expectations with married people with dependent children, living in rented accommodation and whose spouse was not working, receiving the most benefits.

In estimating ξ and x we follow the other papers in this area (for example Lancaster and Chesher (1983), Lynch (1983), Main and Shelley (1988),

[4] Later in the paper we include this benefit measure in an unemployment duration equation. This system is identified by the inclusion of the health variable and the variable indicating whether one lived alone or not in the benefit equation but not in the duration equation.

TABLE 1
Summary Statistics Used in Elasticity Calculations

£ per week	*All*	*Control*	*Treatment*	*Exit*	*No exit*
Benefits	43.73	42.96	43.79	42.38	48.21
Reservation wage	103.08	100.88	103.23	102.41	105.27
Expected wage	119.17	116.21	119.38	118.65	120.87
Sample size	3520	226	3294	2700	820

Jones (1988) and Gorter and Gorter (1993)) and use as a measure of ξ the individual's response to the question 'What is the lowest weekly take home pay you would consider?'. To measure x we use responses to the question 'When looking for a job, what weekly take home pay do you expect?'. The optimal search model outlined earlier predicts that $b \leq \xi \leq x$. In order to be consistent with the theory we eliminate the cases for which this restriction fails. Of the 3,625 individuals for which we had valid data, 105 cases violated this condition. This left us with a sample size of 3,520, which is significantly larger than that used in previous studies (the sample sizes in Gorter and Gorter, Jones, Lancaster and Chesher, Main and Shelley and Lynch were 213, 845, 639, 838 and 52 respectively). The larger sample size should allow us to get more precise estimates of the structural parameters.[5] In this paper we estimate the elasticities for everyone, by control group status and also conditional on exit status in order to determine the extent to which the parameters vary across subgroups. The summary statistics for the relevant variables are given in Table A1. These figures themselves reveal some interesting differences between the groups. In particular, we note that individuals who failed to exit unemployment over the 16 month period for which we have information, have, on average £6 a week more benefits than those who exited. There seems to be little difference in benefit levels, reservation wages or expected wages between the control group (who were excluded from the initial Restart interview) and the Treatment Group who received the interview.

To see the implications of these figures for unemployment duration we estimate the elasticities discussed in Section II. The results of these estimates are presented in Table 2.[6] The first five columns of the Table report the

[5] In our sample 1,438 (41 percent) individuals reported a value of $\xi = x$. The corresponding percentages for the other studies were 25 percent for Main and Shelly, 47 percent for Gorter and Gorter and 46 percent for Lancaster and Chesher, although in the latter case the responses were grouped into intervals. While such responses are not impossible in a search model, they do imply the variance of the wage offer distribution is zero. We will return to this issue later.

[6] The elasticities obtained from excluding those individuals who reported $\xi = x$ are reported in Table A3 of the Appendix. While the elasticity of the reservation wage with respect to both the arrival rate of offers and the benefit level rise, our comparison of the control and treatment group is unaffected by the exclusion of these individuals.

results for our various subsamples, while the final four columns report estimates from previous research using this approach (Lancaster and Chesher (1983), Lynch (1983), Main and Shelly (1988) and Gorter and Gorter (1993)). Comparing our results for all Restart members in column 6 with those of the other studies we find that while our results are within the range of estimates from the previous studies, there are some differences. In particular we note that the elasticity of the reservation wage with respect to benefits appears to be quite low: a 10 percent increase in benefit levels raising the reservation wage by 1.1 percent. Using the mean level of benefits and reservation wages, this implies that a £1 rise in benefits would raise the reservation wage by 25p. One possibility for the difference between our estimate and that of Lancaster and Chesher maybe that our sample consists of workers who were unemployed at least six months, whereas the Lancaster and Chesher estimates refer to a sample from the stock of *all* unemployed workers. As a result the reservation wage reported by the individuals in our sample may already be at the minimum level necessary to insure a positive payoff to work. To the extent that the reservation wage may become more rigid in a downward direction the longer the unemployment spell continues, we might expect changes in benefits to have less of an effect on reservation wages in our sample than in other studies. Evidence that this may indeed be the case can be found in Lancaster and Chesher, who find that the elasticity is highest for individuals with between 3 and 6 months' unemployment and lower for those with longer spells. If we use their data on reservation wages, expected wages and calculated elasticities for individuals with between 6 and 8 months' unemployment we find that a £1 rise in the benefit levels would raise the reservation wage by 23p which is close to the figure of 25p which we find.

Our estimate of the elasticity of the reservation wage with respect to offer arrival rate is 0.10 which again is lower than the estimates of 0.11, 0.15 and 0.14 reported by Lancaster and Chesher (1983), Lynch (1983) and Main and Shelly (1988) respectively. Again, however, it is interesting to note that our estimate is equal to that obtained by Lancaster and Chesher for sample members who were unemployed for between 6 and 12 months.

The third row shows the elasticity of re-employment with respect to unemployment benefits under the Pareto assumption, while the sixth row reports the estimate under the Exponential assumption. Our estimate of the elasticity is close to 1 and appears robust to our assumptions on the wage offer distribution.[7] Later in the paper we estimate a search model using a parametric 2SLS approach. This approach can also be used to estimate the structural parameters of the model. It is worth noting at this stage that the

[7] Our figure is substantially lower than the estimate of −2.89 obtained in Gorter and Gorter. However, using parametric procedures Gorter and Gorter are unable to find a significant effect of either benefits or reservation wages on duration. This leads them to question the robustness of their reported estimates.

estimated benefit elasticity obtained in this manner is −1.63 with a standard error of 0.09.[8] Combining our two results we find that our benefit elasticity is similar to the range of 0.6 to 1 suggested by Lancaster and Chesher (1983), Lancaster and Nickell (1980) and Nickell (1979) but higher than the 0.1 to 0.3 range suggested by Atkinson *et al.* (1984) and Narendranathan *et al.* (1985).

The fourth and seventh rows of Table 2 report the elasticity of re-employment probability with respect to changes in the offer arrival rate, under the Pareto and Exponential assumptions respectively.[9] These results suggest an estimate in the range of 0.1 to 0.2. An alternative interpretation of these figures can be obtained if one assumes the hazard function for a given individual is constant over time. In this instance an individual's completed unemployment duration has an exponential distribution, with mean $1/h$. The elasticity of mean unemployment duration with respect to the offer arrival rate is then the negative of the estimates given in rows 4 and 7. Our results imply that a 10 percent fall in the mean time between offers is associated with a 1 to 2 percent reduction in the average length of unemployment duration.

The fifth row of the Table reports the estimates of σ, the standard deviation of log wage offers. Our estimate of 0.13 is similar to that reported by Lancaster and Chesher and also the value of 0.17 calculated by Jones using the 2SLS procedure.

In discussing the nature of the Restart programme in Section III, it was noted that the programme worked through several channels. One such channel was the threat of benefit suspension for individuals who did not meet the eligibility criteria. In particular, if it was deemed by the Restart counsellor that a claimant was severely restricting the type of work which they would be willing to do, then benefits could be cut or suspended. One way of restricting work options is by setting unrealistic reservation wages, which would lead to individuals being very selective about the jobs which they would accept. In introducing Restart it was believed that a potential impact would be to either lower reservation wages or increase individual responsiveness to job arrivals as a result of the threat of benefit reduction, which would in turn lead to shorter spells of unemployment. The first four columns of Table 2 provide a breakdown of the elasticity estimates by control and exit status. Comparing our elasticities across subgroups we find very little difference either between the control and treatment group or between those who exited unemployment and those who did not. The lack of difference between the control and treatment group is also evident in the reservation wage and expected wage reported in Table 1, where members of the control group reported a reserva-

[8]This estimate is from the reduced form 2SLS unemployment duration equation not reported in the text.

[9]In the Table we present the estimates reported by Lancaster and Chesher and by Lynch in their papers. However, these authors seemed to have overlooked the fact that under the Pareto assumption these elasticities should be equal to the elasticity of the reservation wage with respect to the benefit level.

TABLE 2
Nonparametric Estimates of Search Elasticities (Standard Errors in Parentheses)

Elasticity	*Control*	*Treatment*	*Exit*	*No exit*	*All*	*Lancaster and Chesher*	*Lynch*	*Main and Shelly*	*Gorter and Gorter*
dlog ζ/dlog b	0.10 (0.009	0.11 (0.003)	0.11 (0.003)	0.12 (0.006)	0.11 (0.002)	0.14	0.11	0.16 (0.007)	0.28
dlog ζ/dlog λ	0.10 (0.006)	0.10 (0.002)	0.10 (0.002)	0.09 (0.003)	0.10 (0.002)	0.11	0.15	0.14 (0.004)	0.09
dlog h/dlog β (Pareto assumption)	−0.92 (0.07)	−0.99 (0.03)	−0.97 (0.04)	−1.04 (0.03)	−0.99 (0.03)	−1.0	−0.48	−0.91 (0.03)	−2.89
dlog h/dlog λ (Pareto assumption)	0.10 (0.009)	0.11 (0.003)	0.11 (0.003)	0.12 (0.006)	0.11 (0.002)	0.19	0.30	0.16 (0.007)	0.28
σ (Pareto parameter)	0.12 (0.008)	0.13 (0.002)	0.13 (0.003)	0.13 (0.005)	0.13 (0.002)	0.13	0.19	Not reported	0.09
dlog h/dlog b (exponential assumption)	−0.82 (0.06)	−0.88 (0.03)	−0.86 (0.04)	−0.92 (0.03)	−0 87 (0.03)	−0.96	−0.56		
dlog h/dlog λ (exponential assumption)	0.20 (0.013)	0.21 (0.003)	0.21 (0.004)	0.22 (0.008)	0.21 (0.004)	0.24	0.25		
Sample size	226	3294	2700	820	3520	639	52	338	112

tion wage of £101 while members of the treatment group reported a reservation wage of £103. The similarity between the two groups is again a possible consequence of the fact that there is little scope for further downward revision of reservation wages for our sample of long-term unemployed. In particular, the harsh reality of experiencing 6 months' unemployment and frustrating job search is probably enough to induce a fairly realistic perception of the wage a person could command in the market.[10] This conclusion leads us to suggest that the main aspects of the Restart program may not be to lower reservation wages but rather to change λ, i.e. the rate at which job offers arrive either through initiating contact with employers or by inducing more effective and efficient job search. We turn to these issues in the next section, where a simultaneous equations approach allows us to control for individual characteristics over and above control group status.

IV. SIMULTANEOUS EQUATION ESTIMATES OF THE RELATIONSHIP BETWEEN BENEFITS, RESERVATION WAGES AND SEARCH DURATION

While the above approach provides us with a means of deducing many of the structural parameters of the job search model without specifying a form for the wage offer distribution, it is limited by the fact that examination of the impact of local labour market conditions and personal characteristics on reservation wages and unemployment duration is cumbersome. The results are also conditional on the maintained assumption that the search model is the appropriate model underlying the process, an assumption which cannot be tested in the above framework. Furthermore, the elasticity estimates examine only one channel through which Restart may work, namely by changing individual expectations and as a result changing the minimum wage necessary to induce them to work. To allow for an examination of the impact of an array of personal characteristics on unemployment duration and reservation wages and also an examination of alternative channels through which Restart may reduce unemployment duration we adopt the structural model proposed by Lancaster and Chesher (1984), Lancaster (1985) and Jones (1988). They show that by using log-linear approximations to key functional relations in the job search model one can write the model as a system of ordinary log-linear simultaneous equations, which can be estimated using 2SLS on elapsed durations. This model also allows us to test a key prediction of the search model, namely that reservation wages are positively correlated with unemployment duration. Using the same notation as previously we can

[10]It is interesting to note that as part of the Restart process in operation today, Restart officers provide advice to claimants regarding what is a realistic asking wage in light of their personal benefit circumstances and the market situation. This process takes place after the claimant states an initial minimum wage at which they would be prepared to work.

write the model as:

$$\ln \xi = -\beta_0 \ln t + X_1'\beta_1 + \eta_1 \tag{10}$$

$$\ln t = \beta_2 \ln \xi + X_1'\beta_3 + \eta_2 \tag{11}$$

With a dummy for control status included in the X variables this allows us to examine the precise channels through which Restart effects unemployment duration. By simultaneously modelling the reservation wage and unemployment duration this approach also overcomes the potential problem of endogeneity. As noted by Lancaster and Chesher, if we observe an individual who has been out of work a long time, then we could argue that they are likely to have been using a relatively high reservation wage. On the other hand if people become less choosy the longer they become unemployed, then the longer one is out of work the lower their reservation wage will be. The existence of two causal relationships between ξ and t means that if we are to model this relationship correctly we have no choice but to treat the model as a simultaneous system.[11]

Since the model consists of two simultaneous equations, the issue of identification naturally arises. In estimating the model we use the following exclusion restrictions to identify the parameters of the duration equation: we assume that one's benefit level, the presence of children and the presence of a working partner determine your reservation wage but have no direct effect on your re-employment probability. These exclusion restrictions are of the same nature to those used by Lancaster (1985) who excluded dependent children from the duration equation, since this was viewed as a determinant of the level of unemployment benefit and Jones (1988) who excluded the benefit variable from the duration equation. The consensus in the literature, however, is that exclusion restrictions alone cannot be used to identify the reservation wage equation. As noted by Lancaster (1985) and Kiefer and Neumann (1979), for individuals acting rationally, every variable which affects their re-employment probability should also affect their reservation wage. However, for our purpose the reduced form of the reservation wage equation will suffice to establish (or refute) the existence of a relationship between the control variables and the reservation wage. Of particular concern to us in this paper is the impact of the Restart interview. To capture this we include a control group dummy in both the reservation wage equation and the duration equation, which takes the value 1 if the individual was excluded from the Restart process. This allows us to examine the impact of Restart on the reservation wage and also on unemployment duration after having netted out the impact of the reservation wage.

As in Section III we use the individual's response to the question concerning the minimum wage which they would be prepared to work for, as a

[11]There were earlier attempts to overcome the endogeneity problem, notably Crosslin and Stevens (1977) but they adopted a 2SLS framework with no regard to the fact that the time spent unemployed is a duration variable.

measure of the individual's reservation wage. As before, we restrict attention to the group of individuals who reported rational measures of b, x and ξ.

The results of this model are presented in Table 3 and Table A4 of the appendix.

Table 3 shows the structural estimates of the duration equation. A key prediction of the search model is the positive relationship between unemployment duration and reservation wages. Looking at Table 3 we find that the elasticity of unemployment duration with respect to the reservation wage is 3.2 and highly significant. This is comparable to previous estimates using this approach: Jones (1988) obtained estimates in the range 2.7 to 7.2, while Lancaster obtained an estimate of 1.8. The estimates support the job search model and are in contrast to the results reported by Gorter and Gorter (1993) who concluded that the level of unemployment benefit and the reservation wage were not important in ending a search spell. However, as mentioned earlier the results obtained by Gorter and Gorter differed substantially depending on the procedure adopted, which raises issues concerning the robustness of their estimates.

TABLE 3
2SLS Estimates of Simultaneous Equation Search Model

	Log duration equation	
Variable	*Estimate*	*S.E.*
Log res. wage	3.19	0.19
Control	0.207	0.053
Sex	−0.856	0.063
Age 25	−0.333	0.043
Age 35	−0.490	0.057
Age 45	−0.416	0.057
Age 55	−0.091	0.057
Married	−0.530	0.040
Divorced	−0.303	0.053
Local unemp.	−1.128	0.246
Inner city	0.086	0.034
Race	0.368	0.090
Education	−0.214	0.029
Driver	−0.333	0.032
Rent house	−0.082	0.032
Other house	0.040	0.116
Past unemp.	0.132	0.055
Constant	−11.46	0.805
R^2	0.113	
N	3520	

The coefficient on the reservation wage measures the elasticity of the hazard with respect to the reservation wage, and implies that an individual who raises their asking wage by 10 percent cuts their chances obtaining work by 32 percent. We can also use our estimate of β_2 to make inferences about the shape of the wage offer distribution. It can be easily shown that under the assumption that the wage offers have a Pareto distribution with scale parameter σ then $\alpha = -1/\sigma$, where σ is a measure of the standard deviation of log wages or approximately (as σ tends to 0) the coefficient of variation of offers. Using our estimate of -3.2 we obtain a measure of σ equal to 0.31, which is higher than our estimate of 0.14 reported using the nonparametric procedure as well as those of Lynch (0.19) and Lancaster and Chesher (0.13), but is comparable to previous estimates using the simultaneous equations approach: Jones reports estimates of σ in the range 0.14 to 0.37, while Lancaster and Chesher obtained an estimate of 0.55.

The coefficients on the other control variables in our model are as expected. In particular we find that single people, who live in the inner city, with no qualifications and no driver's licence are all likely to spend longer in unemployment. We also find that those in the treatment group who were subjected to the Restart interview process appear to have significantly faster exit rates from unemployment. Since we have normalized for the role of the reservation wage in the simultaneous equation system we must interpret this significant control group coefficient as evidence that those who do not have a Restart interview experience a lower arrival rate of offers which hinders their exit from unemployment. Again we find that although government interventionist policy can significantly reduce unemployment durations for the long-term unemployed, it appears to do so by increasing the offer arrival rate of jobs or by teaching individuals to search more effectively, but not by reducing reservation wages under the threat of benefit suspension.

Table A4 shows the reduced form estimates of the reservation wage equation. The estimates are both intuitive and similar to those obtained previously (Kiefer and Neumann (1979)). In particular we note that the reservation wage is higher for males, individuals whose spouse is working, the more educated and is also increasing in age. Furthermore we note that in keeping with the search model, individuals with high levels of unemployment benefit also have higher reservation wages. The results also suggest that reservation wages are not significantly different between those receiving the Restart interview and individuals excluded from the Restart process. This is consistent with the conclusion reached earlier on the basis of nonparametric estimates. These results suggest that government intervention in the form of Restart had little impact on individuals' reservation wages. However, they do not rule out a role for Restart. The positive and significant coefficient on the control variable in the duration equation suggests that unemployment duration is significantly lower for those individuals who went through the Restart process. This combined with the insignificance of the control variable in the reservation wage equation suggests that Restart works by increasing the

arrival rate of job offers either through increasing search intensity or through initiating a direct contact with an employer rather than changing the reservation wage that an individual will accept for a given job offer.

V. CONCLUSION

In this paper we have used a unique data set to examine the determinants of long-term unemployment. These data also allow us to conduct a direct test of a key prediction of the optimal job search model, namely that individual reservation wages and the duration of unemployment spells are positively correlated. Our findings support the job search model, with a 10 percent increase in the reservation wage increasing unemployment duration by 32 percent after allowing for possible simultaneity between unemployment duration and the reservation wage.

The nature of our sample also allows us to examine the potential for government policy, and in particular the Restart program, to reduce the duration of unemployment. Our findings show that while Restart may be effective in reducing unemployment duration, it appears to do this by changing the rate at which job offers arrive, either through initiation of contact with employers or through improvements in the search behaviour of the unemployed. Our results show that the Restart programme had little impact on the reservation wages of the long-term unemployed. This suggests that for our sample of long-term unemployed, the reservation wages reported are accurate assessments of the minimum wage needed to ensure a positive payoff to work, which as a result limits the ability of the government to put downward pressure on the reservation wage. The notion that long-term unemployment is high because individuals have unrealistic expectations of their potential worth is not supported in our data.

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REFERENCES

Atkinson, A., Gomulka, J. and Rau, N. (1984). 'Unemployment Benefit, Duration and Incentives in Britain: How Robust is the Evidence', *Journal of Public Economics*, Vol. 23, pp. 3–26.

Crosslin, R. and Stevens, D. (1977). 'The Asking Wage — Duration of Unemployment Relation Revisited', *Southern Economic Journal*, Vol. 43, pp. 1298–1302.

Gorter, D. and Gorter, C. (1993). 'The Relation between Unemployment Benefits, the Reservation Wage and Search Duration'. *BULLETIN*, Vol. 55, No. 2, pp. 199–214.

Jones, S. R. G. (1988). 'The Relationship between Unemployment Spells and Reservation Wage as a Test of Search Theory'. *The Quarterly Journal of Economics*, Vol. 103, pp. 741–65.

Kiefer, N. and Neumann, G. (1979). 'An Empirical Job Search Model with a Test of the Constant Reservation Wage Hypothesis', *Journal of Political Economy*, Vol. 87, pp. 89–107.

Kiefer, N. and Neumann, G. (1981). 'Individual Effects in a Nonlinear Model: Explicit Treatment of Heterogeneity in the Empirical Job-Search Model', *Econometrica*, Vol. 49, No. 4.

Lancaster, T. (1985). 'Simultaneous Equations Models in Applied Search Theory', *Journal of Econometrics*, Vol. 28, pp. 113–26.

Lancaster, T. and Chesher, A. (1983). 'An Econometric Analysis of Reservation Wages', *Econometrica*, Vol. 51, No. 6, pp. 1661–76.

Lancaster, T. and Chesher, A. (1984). 'Simultaneous Equations with Endogenous Hazards', in Neumann, G. and Westergard-Nielson, N. (eds), *Studies in Labor Market Dynamics*,

Lancaster, T. and Nickell, S. (1980). 'The Analysis of Re-employment Probabilities for the Unemployed", *Journal of Royal Statistical Society*, Series A, Vol. 143, pp. 555–66.

Layard, R., Nickell, S. and Jackman, R. (1991). *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press.

Lynch, L. M. (1983). 'Job Search and Youth Unemployment', *Oxford Economic Papers*, Vol. 35, No. 4, pp. 595–606.

Main, B. and Shelly, M. (1988). 'School Leavers and the Search for Employment', *Oxford Economic Papers*, Vol. 40, pp. 487–504.

Mortensen, D. (1986). 'Job Search and Labour Market Analysis', in Ashenfelter, O. and Layard, R. (eds), *Handbook of Labour Economics, Vol. II*,

Narendranathan, W., Nickell, S. and Stern, J. (1985). 'Unemployment Benefits Revisited', *Economic Journal*, Vol. 95 (June), pp. 307–29.

Nickell, S. (1979). 'The Effect of Unemployment and Related Benefits on the Duration of Unemployment', *Economic Journal*, Vol. 89, pp. 34–49.

Van den Berg, G. (1994). 'The Effects of Changes of the Job Offer Arrival Rate on the Duration of Unemployment', *Journal of Labor Economics*, Vol. 12, No. 3, pp. 478–98.

White, M. and Lakey, J. (1992). 'The Restart Effect: Does Active Labour Market Policy Reduce Unemployment?', Policy Studies Institute, London.

APPENDIX

Variable Description

Res. Wage: Reservation wage constructed from the question 'What is the lowest take-home pay you would consider?'.

Inner City: Inner city identifier (1 = inner city).

Sex: Sex (1 = Male, 0 = Female).

Past Unemp.: Proportion of the individuals' working life since 1982 which was spent in unemployment, calculated from JUVOS data.

Dep. Kids: Total number of dependent kids (< = 16).
Toddlers: Total number of toddlers (< = 5).
Local Unemp.: For each 1978jcttwa (job centre travel to work area) this variable measures the decline in unemployment between 1988 and 1990 (Average local unemployment in 1988 − Average local unemployment in 1990).
Control: Restart sub-group (1 = control).
Driver: Do you hold a current drivers' licence (1 = yes).
Married: Married (1 = yes).
Divorced: Divorced/Separated/Widowed (1 = yes).
Race: Race of respondent (1 = white).
Education: Any academic or technical qualification (1 = yes).
Active Partner: Partner working (full or part-time) (1 = yes).
Benefit Entitlement: Predicted benefit entitlement.
Rent House: Rent house from Housing Association etc. (1 = yes).

TABLE A1
Summary Statistics

	Treatment group		*Control group*	
Variable	*Mean*	*S.E.*	*Mean*	*S.E.*
Res. wage	103.23	0.743	100.88	2.36
Benefit entitlement	43.79	0.331	42.96	1.89
Sex	0.701	0.008	0.695	0.031
Age 25	0.280	0.008	0.257	0.029
Age 35	0.166	0.007	0.204	0.027
Age 45	0.124	0.006	0.133	0.023
Age 55	0.083	0.005	0.080	0.018
Married	0.450	0.009	0.442	0.033
Divorced	0.098	0.005	0.133	0.023
Dep. Kids	0.493	0.016	0.482	0.071
Toddlers	0.276	0.011	0.261	0.044
Local unemp.	0.348	0.001	0.345	0.003
Inner city	0.182	0.007	0.190	0.026
Race	0.977	0.003	0.974	0.011
Education	0.559	0.009	0.558	0.033
Driver	0.482	0.009	0.513	0.033
Rent house	0.336	0.008	0.363	0.032
Other house	0.012	0.002	0.022	0.010
Past unemp.	0.409	0.005	0.408	0.018
Active partner	0.211	0.007	0.252	0.029
N	3294		226	

Own House: Own/buying house on mortgage.
Other House: Other form of accommodation other than homeowner, renting from Local Authority or renting privately (e.g. living rent free, squatting...) (1 = yes).
Age 25: A dummy variable taking the value 1 if the individual is aged between 25 and 35. A similar definition applies to Age 35 and Age 45 while Age 55 indicates individuals aged 55 or over.
Ever Paid: Ever worked in a paid job between leaving school and present claim?
Health: Any health problems or disabilities (1 = yes).
Alone: Do you live alone (1 = yes).
Recent Job: Have you held a job in the 5 years preceding the current claim (1 = yes).
U.B. Expired: 1 if the current claim has lasted longer than 12 months, the limit for payment of unemployment benefits.

Note: The reference groups for the age variable used in Table 2, was whether the individual was aged less than 25.

TABLE A2
Specification Used to Predict Benefit Entitlement
(Dependent Variable: Reported Total Benefits)

Variable	*Estimate*	*S.E.*
Ever paid	2.252	1.622
Active partner	−37.674	1.406
Sex	4.577	0.937
Age 25	3.366	1.107
Age 35	2.462	1.356
Age 45	−2.807	1.514
Age 55	−10.916	1.735
Married	20.930	1.655
Divorced	4.062	1.428
Dep. kids	8.473	0.646
Toddlers	−3.122	0.965
Rent house	11.934	1.434
Own house	10.352	1.616
U.B. expired	3.038	0.834
Alone	3.189	1.511
Recent job	−0.721	1.107
Health	1.174	0.830
Constant	24.49	1.469
N	2873	
R^2	0.485	

TABLE A3
Nonparametric Estimates of Search Elasticities Excluding Cases for which $\xi = x$
(Standard Errors in Parentheses)

Elasticity	*Control*	*Treatment*	*Exit*	*No exit*	*All*
dlog ζ/dlog b	0.16 (0.012)	0.19 (0.004)	0.19 (0.004)	0.21 (0.008)	0.19 (0.004)
dlog ζ/dlog λ	0.16 (0.006)	0.17 (0.002)	0.17 (0.002)	0.16 (0.003)	0.17 (0.002)
dlog h/dlog b (Pareto assumption)	−0.83 (0.05)	−0.92 (0.02)	−0.88 (0.02)	−1.02 (0.03)	−0.92 (0.03)
dlog h/dlog λ (Pareto assumption)	0.16 (0.012)	0.19 (0.004)	0.19 (0.004)	0.21 (0.008)	0.19 (0.004)
σ (Pareto parameter)	0.20 (0.008)	0.22 (0.002)	0.22 (0.003)	0.21 (0.005)	0.22 (0.002)
dlog h/dlog b (exponential assumption)	−0.66 (0.04)	−0.72 (0.01)	−0.69 (0.02)	−0.81 (0.03)	−0.72 (0.02)
dlog h/dlog λ (exponential assumption)	0.32 (0.01)	0.36 (0.004)	0.35 (0.004)	0.37 (0.008)	0.36 (0.004)
Sample size	140	1942	1599	483	2082

TABLE A4
Reduced Form Estimates of the Reservation Wage Equation
(Dependent Variable: Log Res. Wage)

	Log reservation wage equation	
Variable	*Estimate*	*S.E.*
Benefit entitlement	0.010	0.001
Control	−0.018	0.021
Sex	0.214	0.014
Age 25	0.068	0.017
Age 35	0.129	0.020
Age 45	0.162	0.020
Age 55	0.145	0.025
Married	−0.107	0.037
Divorced	0.001	0.023
Dep. kids	−0.034	0.015
Toddlers	0.009	0.014
Active partner	0.236	0.054
Local unemp.	0.018	0.100
Inner city	0.005	0.014
Race	−0.120	0.035
Education	0.044	0.011
Driver	0.076	0.011
Rent house	−0.051	0.017
Other house	0.030	0.047
Past unemp.	−0.018	0.023
Constant	3.98	0.066
R^2	0.290	
N	3520	