AN ANALYSIS OF EXIT RATES AND DURATION DEPENDENCE IN REGISTERED UNEMPLOYMENT

Paul Gardiner

Department of Labour

Abstract

Administrative records held by the Department of Labour on people registered as unemployed provide an invaluable and unique source of information regarding the dynamics of the unemployed. This paper provides a description of the unemployment database created from these records, and the results of an analysis which investigates the probability of exiting the unemployment register. An attempt is made to separate the heterogeneity effect from the duration dependence effect. The results indicate that the possession of different characteristics affect an individuals chances of exiting the register and that the results are consistent with the presence of a duration dependence effect.

Labour markets are dynamic in their nature. We know that individuals constantly move between the various labour market states of employment, unemployment and not in the labour force. The Department of Labour's measure of registered unemployed individuals provides a valuable source of flow information on movements into and out of unemployment.

The analysis this paper presents was primarily motivated by the need to look more closely at the unemployment experience of various groups and particularly the long-term unemployed. More specifically, we attempt to investigate the impact that certain characteristics and unemployment duration have on the chances of someone exiting unemployment. We know from previous analysis that different groups of individuals have had markedly different unemployment experiences over the past few years. In addition certain theories suggest that unemployment duration may also influence an individuals chances of leaving unemployment. In particular, employers may use unemployment durations as a signal of potential productivity and will therefore be less willing to hire individuals with long unemployment durations. Also, lengthening unemployment may lead to discouragement and a consequent reduction in job search intensity.

A major concern in the current labour market environment is the increase in both the level and proportion of long-term unemployment. An ability to predict whether an individual is likely to become long-term unemployed and therefore be able to prevent this through early assistance which can be provided by the Department of Labour's New Zealand Employment Service is likely to result in improved outcomes for both the individual and the economy in general. However, the predictive accuracy of the estimated model proved to be fairly weak therefore limiting any such use.

The first section of the paper describes the database used in the analysis that follows. The next section graphically examines how exit probabilities change as unemployment duration increases and vary by individual characteristic. This includes a discussion of the heterogeneity and duration dependence effects on the exit probability. The final section involves an attempt to separate these two effects out using econometric modelling techniques. It is concluded that both effects appear to be important in explaining the declining exit probability profile as duration increases.

Description

When an individual first registers with the New Zealand Employment Service (NZES), details such as gender, age, ethnicity and educational qualifications are recorded on a computerised unemployment register. Subsequent transactions involving the individual, such as a placement or attendance on a training scheme, are also recorded. From these records, a database has been created, linking the demographic characteristics with information about departure from the register[1].

The database includes all people registered as unemployed (including school-leavers) since 1988. While the data is recorded in real time, the interval chosen for the analysis reported in this paper is the standard week, with an individual deemed to have completed one week after seven consecutive days on the register.

Importantly, movements off the register followed by what

the NZES describe as a 're-enrolment due to error'[2] have been ignored in this database. The enrolment date preceding the movement off the register is re-instated and the duration calculated as if the movement off the register had never occurred. This applies regardless of the reason for the re-enrolment or the length of time that has elapsed between the lapsing and subsequent re-enrolment. While this adjustment may ignore some legitimate movements off the register, it is difficult to separate these from true errors. At the same time, we have also chosen to include 're-enrolments retaining duration'[3] as legitimate movements off and on the register.

Exit probabilities of unemployment

The exit probability analysis covers the period July 1989 to June 1993, and refers to the probability that an individual, who has reached a specified duration, will leave the register within the following seven days. There are three aspects that are investigated. First, the exit probability function is examined to see if the shape and/or level has changed over time. Second, the exit probability function for 1993 is disaggregated by demographic characteristics to examine the different exit rates for different groups of people. Third, an attempt is made to identify and quantify heterogeneity effects and to test whether there is a duration dependence effect, that is, whether individuals with different characteristics have different exit probabilities.

The exit probability of an individual conditional on their current duration t is calculated using the following formula:

$$\lambda(t) = 1 - \frac{n_t + 1}{n_t}$$

where

$\lambda(t)$ is the exit probability at time t
$n_t + 1$ is the number of individuals at time t+1
n_t is the number of individuals at time t
t is the duration measured in weaks.

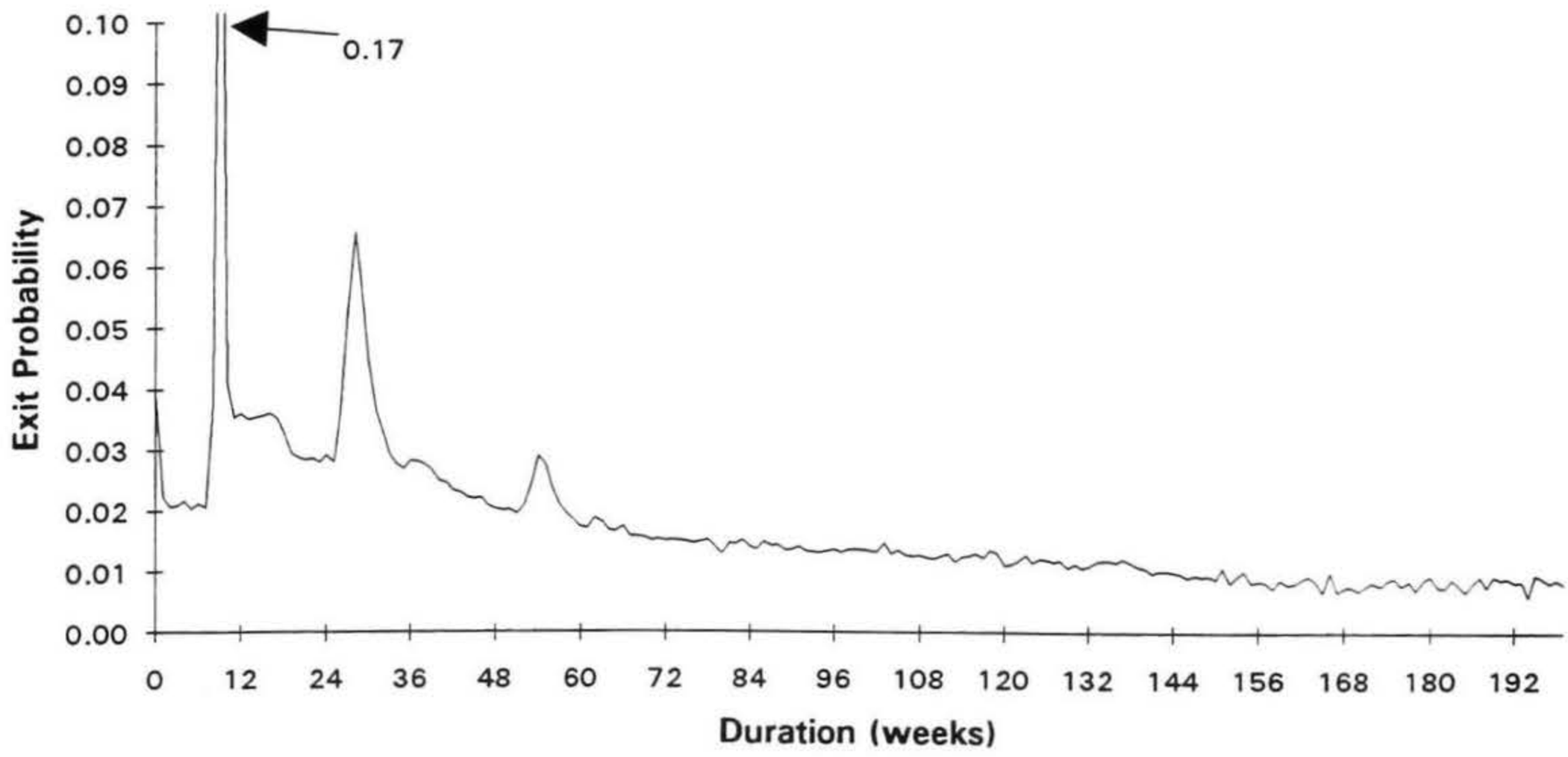
The analysis is divided into four June years, 1990 to 1993. Figure 1 displays the shape of the exit probability function calculated from the database over the entire four year period (July 1989 to June 1993).

There are three main points to note about the shape of the exit probability function. First, the function displays a downward slope which tends to suggest that the longer a person remains unemployed, the less chance that person has of leaving unemployment (negative duration dependence). However, there is an alternative explanation for the declining profile of the aggregate function. Declining probabilities of leaving unemployment at the aggregate level may be due to *ex ante* differences in individuals' likelihood of finding work, most likely determined by the characteristics they possess (the heterogeneity effect). The following analysis tends to suggest that the declining profile is a mixture of both duration and heterogeneity effects.

Second, the slope of the exit probability function becomes almost flat at longer durations (that is, the probability of exit remains fairly constant) indicating no apparent difference in the exit probability of individuals past a certain duration. At the aggregate level, this effect would appear to occur after three years.

The third feature of the exit probability function are the

Figure 1. Exit probability from the Unemployment Register



spikes at nine, 26 and 52 weeks duration. The first, occurring at nine weeks duration, reflects the introduction of an automatic computer program which lapses non-beneficiaries who have not contacted the NZES within the previous eight weeks. The second two, at 26 and 52 weeks duration respectively, reflect the timing of work focus interviews and in the main that many registered unemployed cannot be contacted for the interview and are lapsed, or are lapsed for not attending their interview.

Heterogeneity and duration dependence

There are various explanations for why the exit probability declines with duration. Employers may use unemployment durations as a signal of potential productivity and will therefore be less likely to hire individuals with long unemployment durations. Also if lengthening unemployment duration causes discouragement then the exit probability will also decline as job search intensity decreases.

We postulated earlier in the paper that the declining aggregate exit probability function by duration reflects a mixture of both negative duration dependence (that is, the exit probability declines with increasing duration no matter what characteristics an individual posseses) and heterogeneity effects (that is, certain characteristics an individual posseses result in a lower exit probability).

Figure 2 illustrates how heterogeneity effects can easily be misinterpreted as negative duration dependence effects. The graph presents a stylized downward sloping aggregate exit probability function, and for the purposes of illustration, we will assume the unemployed comprise two homogenous groups of individuals, *a* and *b*. While *a* and *b* have different exit probabilities ($a^e > b^e$), the exit probability is constant for those within each group regardless of their duration, that is, $a^e_t = a^e_{t-1}$ and $b^e_t = b^e_{t-1}$.

At any point in time, the aggregate curve represents a weighted average of the exit probabilities for the individual groups, the weighting being determined by the number of each people in each group at the time. Let us say that at t = 0, there are twice as many people in group *a* than in group *b*. As time passes, relatively more of group *a* will leave unemployment, reflected in their higher exit probability. By the time we reach t = 26, the number of people in group *a* equals the number in group *b*. Because of the different ratio of *a* to *b* on the register at t = 26 compared with t = 0, the average exit probability will be lower. This is shown in the graph by a declining aggregate exit probability.

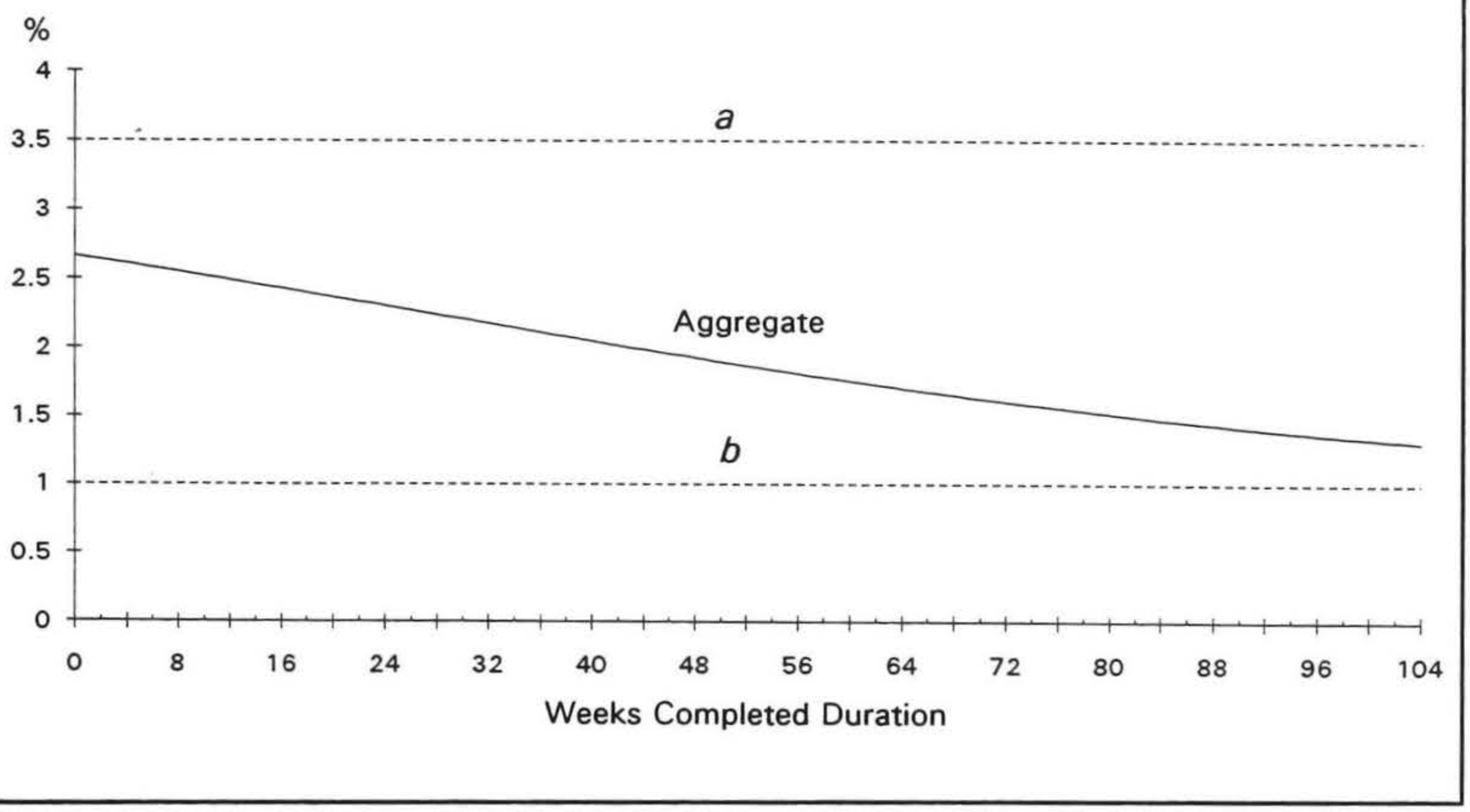
In summary, differences in exit probabilities associated with different characteristics of the individuals may result in the aggregate exit probability being downward sloping.

We begin our analysis by examining graphically the exit probability function over time and by various characteristics.

Exit probabilities

A breakdown of this aggregate function over each individual year displays the same downwards slope and spikes. In 1990 there was a higher probability of exit from the register over the first 24 weeks than the following three years. This is particularly true at the short duration end. This probably reflects the general state of the economy over that period. The 1991 year appears to display the lowest probability of exit at most durations.

Figure 2. Stylised exit probability



The characteristics that were identified from the database were gender, age, ethnicity, qualifications held and region. The following disaggregation by these characteristics were examined for the 1993 June year only.

A breakdown by gender reveals the same characteristic shape as the aggregate exit probability function. In 1993, females appear to have a higher probability of leaving the register at all durations. This finding is consistent across the preceding three years. This reflects both a prevalence for women to be involved in part-time, casual, and temporary work and the lower attachment of women to the labour force.

The analysis by age was broken down into four groups: 15 - 19 years, 20 - 24 years, 25 - 44 years, and 45+ years. The 15 - 19 years olds displaying the highest exit probability and the 45+ year olds displaying the lowest exit probabilities. This reflects to a large extent the lower attachment to the labour force of the younger age groups.

The 15 - 19 years group also displays a large amount of variation between adjoining weeks duration, particularly at the longer duration end. This reflects, to a large extent, the small number in this group on the register after two years and hence the impact this has on the calculated exit probability.

The ethnic groups analysed were Pakeha, Maori, and Pacific Islands people. The exit probability functions display the familiar shape, with Pakeha displaying a higher probability of exit than Maori and Pacific Islands people at virtually all durations. This is yet another indicator of the labour market disadvantage of Maori and Pacific Islands people. Pacific Islands people appear to have a lower exit probability than Maori except at the spikes.

Educational qualifications are disaggregated into five groups: no formal qualification, school certificate, other school (that is, UE and/or Bursary), post-secondary and trade, and university degree. The no formal qualifications group appeared to have the lowest probability of leaving. The university degree qualifications group displays the highest probability of leaving, reflecting the importance of qualifications.

A final breakdown by region indicates that the highest probability of exit was experienced in the Hawkes Bay region and the lowest in the Northland region. The higher probability in the Hawkes Bay is due mainly to the higher amount of seasonal work available in that area.

The above analysis disaggregated the exit probability function by only one characteristic. The next stop was to combine the four characteristics[4]. The intention here is to better isolate the negative duration dependence by achieving as similar a sample of characteristics as possible. A combination of 24 exit probability functions were produced. Some of these groupings contained low numbers and this tended to be reflected in increased volatility of the respective probabilities.

Graphical analysis suggested non-Maori had a higher probability of leaving the register than Maori at all durations regardless of age or qualifications held. This advantage tends to disappear after about two years continuous duration.

The important conclusions from the graphical analysis are that different groups have varying exit probabilities and that even after obtaining as similar a group as possible there appears to be negative duration dependence. However, the graphical analysis is limited and we turn to econometric techniques in the next section to better address this issue of negative duration dependence.

Table 1. Sample from the Registered Unemployment Database, 1983-1993

Variable Name	Mean
Dur	33.7
Age	28.9
Male	62.0
Female	38.0
Pakeha	64.0
Maori	25.0
Island	6.0
Other	5.0
Noqual	59.0
School	29.0
Trade	7.0
Tert	5.0
Auck	25.0
Ham	4.0
Wgtn	8.0
Chch	8.0
Dun	4.0
Rural	51.0
Comp	85.0

Number of observations = 74,598

Variable	Standard Deviation	Min.	Max.
Dur	44.4	0	543.1
Age	10.7	15.0	66.0

Econometric analysis

The analysis to date of exit probabilities has consisted of graphical techniques. This section extends this analysis utilising econometric modelling techniques to attempt to further refine the analysis of heterogeneity and duration dependence effects.

From graphical analysis of unemployment spells we have observed that the probability of leaving unemployment declines as the length of time unemployed increases. As identified previously this could be the result of the heterogeneity effect alone or a combination of this effect with

Table 2. Estimation Results for the Weibull Specification of the Exit Probability Function

Variable Name	Estimate	Chi-Square	Pr>Chi-Square
Male	0.2745	869.07	0.0001
Age	0.0208	2048.26	0.0001
Maori	0.2112	366.36	0.0001
Island	0.2251	128.09	0.0001
Other	-0.0032	0.02	0.8859
School	-0.2374	512.43	0.0001
Trade	-0.3754	419.61	0.0001
Tert	-0.3865	334.19	0.0001
Auck	0.0727	39.81	0.0001
Ham	0.0586	6.40	0.0114
Wgtn	0.1055	37.84	0.0001
Chch	0.1448	75.46	0.0001
Dun	0.2324	88.90	0.0001
Scale	1.1183		
Constant	5.1375		

negative duration dependence. The econometric method employed in this section allows the separation and testing of the heterogeneity effect and the duration dependence effect.

Five characteristics identified in the previous analysis are used here: gender, age, ethnicity, qualifications held and location of the unemployed individual.

These are not the only factors that may influence an individuals chances of leaving unemployment. Certainly important variables such as the general state of employment demand, income while unemployed, the unemployed individuals reservation wage, and the number of dependents are unable to be included in this analysis. We will return to this problem of omitted variable bias.

Theoretical specifications

The exit probability function can be divided into two components: a component which recognises the heterogeneity of the population under consideration and the duration dependence component.

The simplest place to begin is to look at the exit probability distributions for a homogeneous population. In our example we focus on two: the Exponential and the Weibull distributions. This specifies the baseline exit probability.

Let T be a nonnegative random variable which represents the length of an unemployment spell and let t represent a typical point in its range. The Exponential distribution has as its specification an exit probability function which is constant over all durations which implies no duration dependence.

$$\lambda(t) = \gamma$$

where $\gamma > 0$

The Weibull distribution has as its specification an exit probability function where duration dependence is a possibility

$$\lambda(t) = \gamma\alpha t^{\alpha-1}$$

where $\gamma > 0$ and $\alpha > 0$

The exit probability function is increasing in duration if $\alpha>1$ (that is, for our example the chance of leaving unemployment would increase as the spell length increased), decreasing if $\alpha<1$ (that is, the chance of leaving unemployment would decline as spell length increased), and constant if $\alpha=1$, which is the exponential case as above.

The specification of the Weibull distribution provides a convenient way of testing duration dependence. If α is not significantly different from 1 then we cannot reject the hypothesis of no duration dependence.

Adding covariates recognises the heterogeneity effect on which the exit probability may depend.

For the Exponential

$$\lambda(t, x) = \gamma \exp(x\beta)$$

In terms of log duration this can be written as

$$Y = \alpha - x\beta + \varepsilon$$

$Y = \log T$

$\alpha = -\log \gamma$

ε = an error term with an extreme distribution

For the Weibull

$$\lambda(t, x) = \gamma\alpha t^{\alpha-1} \exp(x\beta)$$

Table 3. Expected Duration for an Unemployed Pakeha Male aged 25 with No Qualifications Living in Auckland

Expected Duration = exp [(1)*(0.2745) + (25)*(0.0208) + (1)*(0.072+ (1.1183)*(log(log(2))[1]) + 5.1375]*0.1= 26.9 weeks

[1] The median of an extreme value minimum distribution is log(log(2)).

In terms of log duration this can be written as

$$Y = \alpha + x\beta^{*} + \sigma\varepsilon$$

where

$$\alpha = -\log\gamma$$

$$\sigma = \alpha^{-1}$$

$$\beta^{*} = -\sigma\beta$$

These forms suggest two distinct generalisations of the Exponential and Weibull specifications. First, the effect of the covariates is to act multiplicatively on the exit probability function (the proportional exit probability model). Second, both of these models are log-linear, the covariates act multiplicatively on duration (the accelerated failure time model).

The analysis that follows estimates both the Exponential and Weibull models in the log-linear form[5]. The data used to estimate this model includes spells of unemployment that have not yet been completed. These spells are referred to as right-censored spells in that we do not know when they will be finished. The program used to estimate the accelerated failure time model takes this fact into account in specifying the log-likelihood function.

Regression results

A selection of random samples each containing approximately 75,000 records was taken from the database. Each record contains an observation indicating length of unemployment spell, gender, age, highest educational qualification obtained, ethnicity and locality. Table 1 summaries the characteristics of a particular sample (a description of the variables is contained in the Appendix).

As is usual with dummy variables, the number of dummy variables included in the regression to describe each characteristic equals D-1 (where D = the total number of possible outcomes for each characteristic). For example, the variables school, trade and tert were included but noqual was not so that the default level of qualifications is no qualifications.

For each of the samples tested, both Exponential and Weibull models were estimated. In all cases the hypothesis that the scale factor was equal to one (as is implied by the exponential) was easily rejected. Table 2 presents the regression results obtained from one particular sample.

As Table 2 shows, all of the variables (with the exception of Other) are very significant. The coefficients can be interpreted as semi-elasticities. The main results were:

* the mean expected duration for an unemployed male was 27.5 percent, higher than that for females over the sample period (other characteristics being equal);

* as expected, duration is negatively correlated with educational achievement. The achievement of school qualifications reduces the expected duration (relative to a person without any qualifications) by 23.7 percent, while trade or tertiary qualifications reduce the expected duration by around 38 percent;

* expected duration is positively related to age. The mean increase in expected duration rises by around 2 percent per year;

* Maori and Pacific Islands people are estimated to have around a 22 percent longer expected duration, compared to Pakehas or other ethnicities even after allowing for different levels of educational attainment and locality etc;

* over the period covered by the sample, people living in

Table 4. Expected Durations

Age	15	25	35	45	55
Qualification					
No qual	21.9 (7.8)	26.9 (33.1)	33.1 (50.7)	40.8 (35.5)	50.2 (36.5)
School	21.2 (34.1)	26.1 (22.0)	32.2 (45.9)	39.6 (58.3)	
Trade	18.5 (28.0)	22.8 (35.7)	28.0 (48.1)	34.5 (44.4)	
Tert	18.3 (32.4)	22.5 (34.7)	27.7 (28.5)	34.1 (20.3)	

Note: Actual durations from the sample contained in brackets

the five main metropolitan areas had a longer expected duration (compared with those people living outside those areas), with the degree of disadvantage being greatest in Christchurch and Dunedin; and

* the estimated scale variable is greater than one. This indicates negative duration dependence, that is, the longer a person is unemployed, the less likely this person will leave the register in the following week. However, given the limited range of variables included in the regression (ideally we would want to include income variables and number of dependents) caution is advised in interpreting the scale variable because of this omitted variable bias.[6] Therefore, it is more correct to say that these results do not reject the existence of negative duration dependence.

Predictive Ability

Potentially, the regression results can also be used to predict the duration of a particular person with given characteristics. For example; consider a male pakeha aged 25, living in Auckland with no educational qualifications. The expected duration for this person is calculated as follows (using the coefficients obtained from Table 2)

Unfortunately, however, the predictive power of this regression is relatively weak. This is not surprising, as preliminary analysis indicated that the variables available had fairly low explanatory power. The lack of predictive power can be illustrated in two ways.

First, given the above characteristics in the above example, although the mean expected duration is 26.9 weeks, there is a 20 percent possibility of the actual duration falling outside of the range of 3.3 - 101.8 weeks.

The lack of predictive power can also be demonstrated by comparing the actual and predicted mean durations given a particular set of characteristics. For example, Table 3 below compares the actual and predicted unemployment duration for a pakeha male living in Auckland, given a range of alternative educational statistics and ages.

As Table 4 shows, for those people with other than tertiary qualifications, the actual and predicted durations tend to increase with age. However, the accuracy of these predictions is relatively poor (the average absolute error is 11.6 weeks). Interestingly, for those people with tertiary qualifications, the expected durations tend to fall with age rather than increase. This suggests that a more complex method of accounting for the influence of age on duration is required.

Regression stability across samples

To test the stability of the coefficients, a number of alternative samples were taken and regression analysis performed. Alternative samples covering the entire data period (1983 - 1993) displayed very little coefficient variation.

Samples covering alternative time periods were also tested. Given the lack of synchronisation of regional output and employment trends, the locality variables, in particular, were expected to display some variation from the total period samples.

The date chosen to split the samples was 1 June 1991. This split was designed to capture the period of rapid structural adjustment followed by economic recovery, although average unemployment duration continued to trend upward over the entire period.

Samples were taken over each of these periods and the following results obtained:[7]

* as expected, predicted durations for all characteristics were greater for the 'late' samples than the 'early' samples;

* the male disadvantage appeared to be greater in the late samples;

* the Pacific Islands disadvantage in particular, but also the Maori disadvantage, was greater in the late samples;

* the relative advantage of school qualifications (and to a lesser extent tertiary education) was smaller in the late sample;

* the Auckland locality moved from being a source of relative advantage in the early samples to being a source of relative disadvantage in the late samples. The relative disadvantage of Dunedin halved, but the relative disadvantage of Christchurch increased; and

* the scale variable (which indicates duration dependence) moved from indicating negative duration dependence in the early samples to positive duration dependence in the late samples.

This last result is somewhat strange, and emphasises the degree of uncertainty that exists in a model containing obvious mis-specification problems (particularly with respect to missing explanatory variables). This further suggests that the results should be treated with caution.

Conclusion

The results indicate that not only do exit probabilities differ by characteristic but they also decline over time as the result of negative duration dependence. However, while variations in unemployment durations can be partially explained by differences in gender, age, education qualifications, ethnicity and locality, a substantial portion of the variation remains unexplained. The absence of income variables is likely to be particularly important. Various theories emphasize the importance of the reservation wage as an explanatory variable of unemployment

duration. The model's lack of explanatory power means that although the results are consistent with the possibility of negative duration dependence, the results should be treated with caution.

Future research

Further work into obtaining omitted explanatory variables will be a priority for any further econometric work. Such variables as income, both from previous job and received while unemployed, number of dependents, and local demand conditions readily spring to mind. Some of these variables could be collected by either undertaking a survey of unemployed individuals or there may be the possibility of matching databases between government departments.

References

Chapman, B.J. and P.N. Smith 1992 Predicting the long-term unemployment: A primer for the Commonwealth Employment Service in R.G. Gregory and T. Karmel (eds) Youth in the eighties: *Papers* from the Australian longitudinal survey research project ANU Australia

Kalbfleisch, J.D. and R.L. Prentice 1980 *The statistical analysis of failure time data* New York Wiley

Kiefer, N.M. 1988 Economic duration data and hazard functions *Journal of economic Literature* 15: 646-679

Lancaster T. 1979 Econometric methods for the duration of unemployment *Econometrica* 47(4): 939-956

Lynch L.M. 1985 State dependency in youth unemployment: A lost generation? *Journal of Econometrics* 28: 71-84

SAS Institute Inc. 1989 *SAS/STAT User's Guide Version 6 Fourth Edition* Volume 2 Cary NC

Notes

1. It should be noted that this database contains some inconsistencies as it is compiled from several different source files. This means the database should not be construed as a definitive history of all the individuals who have registered with the NZES.

2. This type of enrolment occurs when an individual has been inappropriately moved off the register, or if an Employment Adviser is satisfied that the re-enroling individual would be unduly disadvantaged if they were made to commence their duration at zero. In either case, the Employment Adviser has the discretion to wind-back the enrolment date to the previous enrolment date. As from 26 July 1993, such wind-backs could only occur within two months of leaving the register.

3. This type of enrolment occurs when an individual legitimately moved off the register but for whatever reason came back shortly afterwards and at the discretion of the Employment Advisor had their duration re-instated.

4. The region variable was excluded from this analysis as at the time of calculation the region variable had not been coded.

5. The SAS/STAT procedure LIFEREG was used. The model is given as

$$Y = \alpha + x\beta + \sigma\varepsilon$$

where Y is the log of duration, x is a matrix of covariates, β is a vector of unknown regression parameters, is an unknown scale parameter (1/), and 86 |is a vector of errors assumed to come from a known distribution (in our case an extreme value distribution).

The parameters are estimated by a maximum likelihood procedure using a Newton-Raphson algorithm. The estimates of the standard errors of the parameter estimated are computed from the inverse of the observed information matrix.

6. See Lancaster 1979

7. Samples before 1 June 1991 include all those people registered unemployed prior to 1 June 1991 and had completed their spells between 1 March 1990 and 1 June 1991. Samples after 1 June 1991 include those people who had registered after 1 June 1991 and whose spells were either completed or uncompleted. Hence, neither sample will include those people who were registered before 1 June 1991 and left the register after 1 June 1991.

Author

Paul Gardiner is an Economic Analyst at the Department of Labour, PO Box 3705, Wellington.

Appendix. Description of variables

Variable name	Description	Units
Dur	Length of spell (duration)	Weeks x 10
Age	Age at end of spell	Years
Male	Dummy variable for male gender	= 1 if true; else =0
Female	Dummy variable for female gender	= 1 if true; else =0
Pakeha	Dummy variable for pakeha ethnicity	= 1 if true; else =0
Maori	Dummy variable for Maori ethnicity	= 1 if true; else =0
Island	Dummy variable for Pacific Islands ethnicity	= 1 if true; else =0
Other	Dummy variable for Other ethnicity	= 1 if true; else =0
Noqual	Dummy variable for no formal qualifications	= 1 if true; else =0
School	Dummy variable for school qualifications only	= 1 if true; else =0
Trade	Dummy variable for Trade qualifications highest	= 1 if true; else =0
Tert	Dummy variable for tertiary qualifications highest	= 1 if true; else =0
Auck	Dummy variable for registered in Auckland Metro area	= 1 if true; else =0
Ham	Dummy variable for registered in Hamilton Metro area	= 1 if true; else =0
Wgtn	Dummy variable for registered in Wellington Metro area	= 1 if true; else =0
Chch	Dummy variable for registered in Christchurch Metro area	= 1 if true; else =0
Dun	Dummy variable for registered in Dunedin Metro area	= 1 if true; else =0
Rural	Dummy variable for registered in other area	= 1 if true; else =0
Comp	Dummy variable for spell is completed	= 1 if true; else =0