EMPLOYMENT DYNAMICS IN REGIONAL LABOUR MARKETS: AN APPLICATION OF GROSS FLOWS ANALYSIS

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Abstract

This paper uses gross flows data for regions to show how the chance of leaving employment varies from place to place within New Zealand and how this risk of leaving employment influences subsequent search behaviour. We define labour market risk as the failure to sustain a continuous income stream through employment. Estimates of employment risk are made by applying a linear logit model to selected transition probabilities estimated from a quarter to quarter gross flows matrix constructed from New Zealand Household Labour Force Survey returns for the 14 year period 1986 to 1999. We show how the risk of employment separations increase as the size of regional labour markets declines and their demand for labour weakens and how the diminished opportunities for employment in the peripheral regions encourages active rather than passive searching among those who leave employment. In regions with relatively high labour demand leaving employment is more likely to be followed by withdrawal from the labour force. By contrast, labour leaving employment in the weaker, provincial, labour markets is more likely to be followed by active searching (and hence unemployment). The way in which employment risk modifies search behaviour across the country affects the unemployed rate, raising it in weak markets and lowering overstating it in strong markets both temporally and geographically.

Keywords: *unemployment, gross labour flows, risk, regional labour markets*

Risk society, as Ulrich Beck uses the term, "describes a phase of development of modern society in which the social, political, ecological and individual risks created by the momentum of innovation increasingly eludes the control and protective institutions of industrial society" (Beck, 1999:72). Although Beck is concerned with 'society at large', it is clear that some of its members are exposed to substantially higher risks than others.[1] Our particular interest here is in aspects of risk in the labour market, and especially in less secure regional labour markets. In this paper we show how the concept of risk not only highlights the geographic variability of the labour market but alters search behaviour in ways that feedback into indicators we use to judge the economic health of regions.

Gross flows refer to flows of the working age population between three mutually exclusive labour market states: employment, unemployment, and outside the labour force. Measured over months or quarters these flows indicate the number of people entering and leaving the labour market as well as those moving from employment and unemployment within it. The nine possible flows that interconnect the three states collectively depict the dynamics.

The study of labour market dynamics can be traced back at least as far as the 1960s. Holt and David (1966), for example, were concerned with the way searching individuals matched job vacancies and how this influenced the behaviour of key magnitudes like unemployment. Most of the early empirical work focussed on the behaviour of the nation's working age population as they move between labour market states (see for example Perry, 1972; Marston, 1976; Clark and Summers, 1979; Foster, 1981, and Foster and Gregory, 1984; Blanchard and Diamond, 1990, 1992; Burgess, 1994). More recently attention has shifted to the efficiency of the vacancy-worker matching process (e.g. Burda and Wyplosz, 1994; Barume and Horvath, 1995 and Beeson Royalty, 1998).

Despite the insights gained through the study of gross flows at the aggregate level there have been relatively very few applications at the sub-national level (examples include Schettkat, 1996; Lazar, 1977; Armstrong and Taylor, 1983 and 1985; Martin, 1984; Green, 1986; Jones and Martin, 1986; Gorter, Nijkamp and Rietveld, 1990; Jones, 1992, 1993, 1998a and b; Bennett and Pinto, 1994; Martin and Sunley, 1999).[2] Recently several applications on matching functions using regional data have begun to appear (e.g. Ritter, 1993; Gorter and van Ours, 1994; Broersma, 1997; Mortensen, 1994).

When regional gross flows have been analysed it has been primarily to measure the relative importance of gross flows into and out of *un*employment. Although collectively results of this regional research have been modest they have at least established that the dynamics underlying the un-

employment rate differ substantially from one region to another.[3] By contrast relatively little attention has been paid to the regional dynamics of the other main states, that is to the gross flows into and out of employment and the labour force as a whole.

In this paper we argue that the dynamics which underlie *employment* levels are of particular interest in regional and local labour market contexts because of the local multiplier effects of earned income. Losses which fall unevenly on people grouped by age, gender, occupation alone are geographically diffused but when they are grouped by place the adverse effects of employment loss generate negative externalities and compound themselves locally. For example, if the number employed falls severely in a locality then local spending falls, trade declines, net out-migration increases and the declining labour pool can lead to the net out-migration of further potential employers. When it comes to understanding the standard of living in a region and regional inequality it is the risk of leaving employment rather than simply the likelihood of becoming unemployed that is important.

One of the reasons for the limited attention paid to gross flows at the regional level is the lack of appropriate data. The release of full gross flows data at the regional level by Statistics New Zealand used in this study opens up opportunities to explore the dynamics that lie behind all three key rates; the *un*employment rate, the employment rate and the labour force participation rate.

The use of panel data to study labour markets, although well established internationally has been realised only lately in New Zealand. Even though a feasibility study was undertaken in 1976 and government approval was obtained in 1979, the Household Labour Force Survey (HLFS) did not start producing data until the last quarter of 1985. Gross labour flow analysis was not applied until the 1990s when sufficient number of years of the household labour force survey had elapsed to provide adequate information (see Grimmond, 1993a; Silverstone and Gorbey, 1995; Gardiner, 1995; Herzog, 1996; Irvine, 1995; Wood, 1998).

As of the late 1990s, the data published from the HLFS was based on a questionnaire applied quarterly to a stratified sample of over 15,000 private *dwellings* throughout New Zealand.[4] Information is obtained on *each resident* in the dwelling yielding about 30,000 individual respondents each quarter. Households remain in the sample for two years, one-eighth of sample *households* being rotated out of the survey each quarter and replaced by a sample of new households. In their first quarter households are interviewed in person regarding their participation in the labour market and then again by telephone over the successive quarters. Measures of change in the numbers employed, unemployed and those outside the labour force are based on the *matched* households only, that is the 7/8ths of the survey that remain in the sample from quarter to quarter. [5]

The remainder of the paper is organised as follows. We begin with an overview of labour market dynamics in the most heavily populated region of New Zealand, Auckland. This allows us to introduce the basic data sources, concepts and magnitudes involved in gross flows analysis. The subsequent section then outlines the basic model used to estimate the risk of leaving employment and the next section presents the results. We then discuss a number of points arising from the use of gross flows in general , additional issues that arise at a regional level, and we end the paper with some conclusions and implications.

Labour market dynamics

Geographers, regional scientists and those economists who venture into subnational issues have tended to describe the labour market conditions of regions by using *rates*, particularly the unemployment rate (e.g.Vedder and Galloway, 1996; Martin, 1997; also see Gleave and Palmer, 1980), and the labour force participation rate (e.g. Gordon, 1970, Taylor, 1968, Elhorst, 1996, Greenlaugh, 1977, Molho, 1983 and Gallaway, Vedda and Lawson, 1991). These rates are based on stocks constructed from the standard classification of the working age population into the employed (E), unemployed (U) and those not-in-the-labour force (N). The unemployment rate is calculated as u = U/(U+E), and the labour force participation rate as l = (E+U)/(E+U+N). Employment refers to paid work of more than one hour per week and therefore includes both full time and part-time work.

Following international practice, New Zealand defines the 'unemployed' as those in the working-age population who are without a paid job, available for work, and have actively searched for work in the four weeks ending with the reference week (or are starting a new job within four weeks). For reasons expressed by Clark and Summers (1979) and others about the narrowness of this definition we have extended it to include those who were without employment (during the reference week) and available (but not actively seeking work) as well as those actively seeking (but not available for work), plus those who seek work through newspapers only. The result is a new wider category of unemployed we call the *jobless*. By using the jobless (J) as our measure of 'unemployment' we not only reduce much of the ambiguity surrounding the narrow official definition of the unemployed but we nearly double the number of 'unemployed' thus reducing the sampling error typically associated with this gross flows category.

Our analysis of gross flows in the New Zealand regional context is therefore be based on flows between three categories, the employed E, the jobless J and those outside the labour force N. In order to illustrate the typical pattern of labour market flows that can be generated in this way we take the reader through an analysis of the quarter-by-quarter flows of male workers in Auckland. As well as offering a convenient illustration of the gross flows method the Auckland case also serves as the statistical base against which to compare the experience of other New Zealand regions.

Analysing gross flows: an example

Table 1 labels each of the flows between the time periods Q_{t-1} and Q_t in the standard gross flows matrix. So for example, EJ refers to the flow of people from the state of employment in the previous quarter, t-1, to the state of joblessness (J) in the following quarter, t. The cell EN denotes flows over the same period from employment to not-in-the-labour force, and the cell EE counts the number who remained in employment from one quarter to the next, and so on for the remaining six cells in the matrix. The three entries in main diagonal of the matrix {EE, JJ and NN} refer to individuals who have not changed their status from quarter to quarter. The six off-diagonal cells count those who have made a transition {EJ, EN, JN, JE, NE and NJ}. The rightmost column E., J. and N. refer to the number in each category at the beginning of the period; they are the sums of the row entries e.g. E.= EE + EJ + EN.

Table 1 Gross flow addresses

Quarter $_{t-1}$	Quarter $_t$			
	E_t	J_t	N_t	Total
E_{t-1}	EE	EJ	EN	E.
J_{t-1}	JE	JJ	JN	J.
N_{t-1}	NE	NJ	NN	N.

The gross flows of male workers in the Auckland region is described in table 2 for the interquartile period 3/91 to 4/91.. The table shows firstly how the 289.8 thousand men of working age surveyed in the third quarter of 1991 were distributed over the three states: 143.1 or 49.5 percent were employed, 27.5 thousand (9.5 percent) were unemployed and the remainder, 118.9 thousand (41 percent) lay outside the labour force.[6] Summing the off-diagonal entries reveals that an estimated total of 40.1 thousand men or 14 percent of the region's working age population changed their labour market state within the space of only three months.[7]

Table 2 The gross flows matrix. Males in the Auckland region between quarter 3 and 4, 1991 (in thousands)

Quarter $_{t-1}$	Quarter $_t$			
	E_t	J_t	N_t	Total
E_{t-1}	**131.8**	4.1	7.5	143.4
J_{t-1}	5.4	**12.7**	9.4	27.5
N_{t-1}	7.2	6.5	**105.2**	118.9

Source: Statistics New Zealand, Special tabulation from the Household Labour Force Survey.
Rounded to the nearest 100.

The sheer volume of churning (or turnover) within this regional labour market is impressive, but it is also typical of both national and regional markets in general. In terms of learning how the regional labour market functions, it is not the absolute number moving that is most useful but the normalised values, that is the probability that an individual in any given state will in fact change state within the time period. For example, the probability that an individual who is employed in t-1 (E) will become jobless (J) in the next quarter is EJ/E which, from table 2, is 0.028=4.1/143.4 or about 3 in every one hundred employed.

It is apparent from the full set of transition probabilities in table 3 that as a group the employed in Auckland are relatively stable with over 9 out of 10 male workers remaining employed from one quarter to the next. The next most stable group are those outside the labour force, with 8.8 out of 10 staying outside for the duration of the quarter. By contrast, the unemployed are quite unstable - even when we doubled the size of this category to include the jobless. Less than half of those who were jobless in one quarter were recorded as such in the following quarter.

We also learn from Table 3 that between one quarter and the next only about twenty percent of those leaving joblessness actually move into employment (JE) that just under half remain jobless (JJ), and that over one third leave the labour force altogether (JN). This high propensity to leave (and reenter) the labour force is one of the big revelations from the extensive empirical literature on gross flows. The more general point is that few of the features that emerge from table 3 are unique to Auckland or New Zealand but are characteristic of gross flows matrices over a range of countries.[8]

Table 3 Transition probabilities of males in the Auckland region, quarter 3-4, 1991

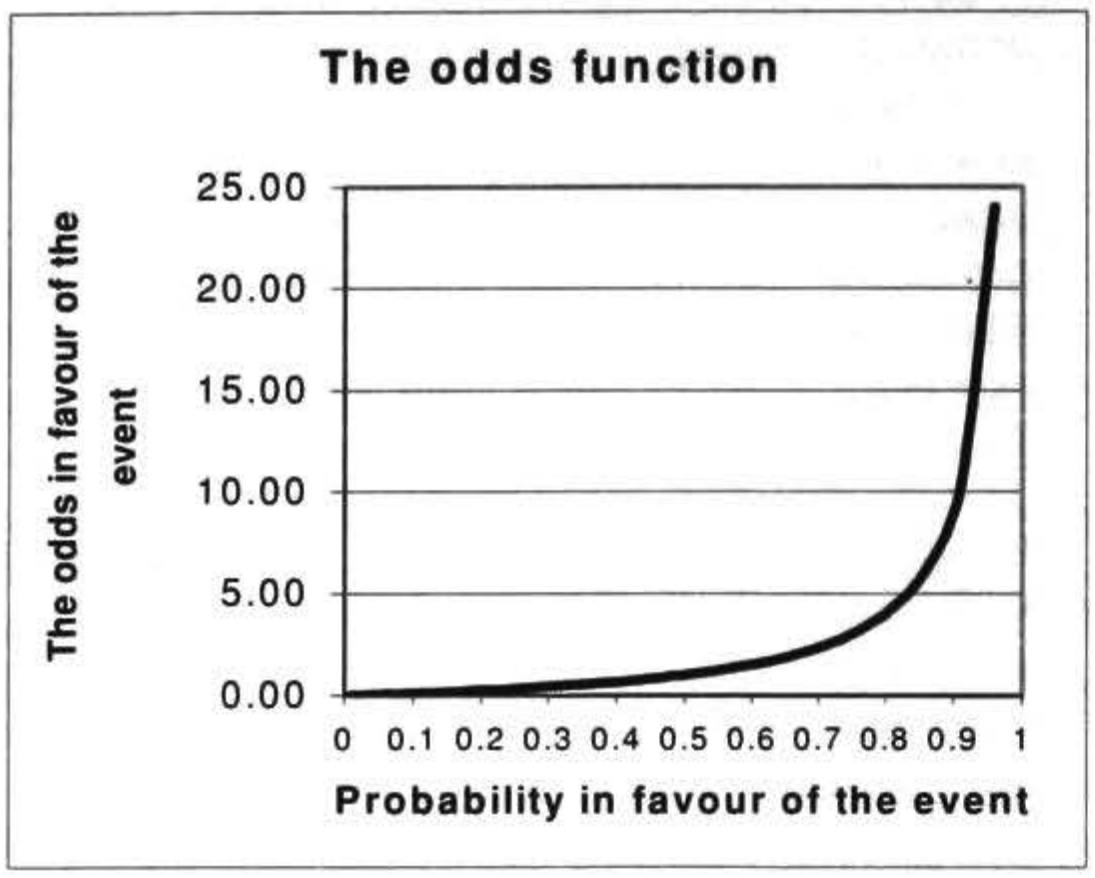
Quarter $_{t-1}$	Quarter $_t$			
	E_t	J_t	N_t	Total
E_{t-1}	**0.919**	0.028	0.052	1.00
J_{t-1}	0.196	**0.464**	0.341	1.00
N_{t-1}	0.061	0.054	**0.885**	1.00

Source: Statistics New Zealand. Special tabulation from the Household Labour Force Survey.

Space does not permit us to analyse all the flows in such a matrix and for the purposes of this paper we will focus primarily on the first row – what happens to the employed. The results are instructive. For example, almost two-thirds of all men in Auckland who leave employment withdraw from the labour force, the remainder become jobless.[9]

It is common in the linear logit models we use below to express transition probabilities in terms of the odds ratio, p/(1-p). Figure 1 plots the relationship between the odds ratio (or) and the probability in order to draw attention to

Figure 1. Transforming probabilities into odds



the way in which the odds rise rapidly the more likely the event. From table 3 for example we learn that the odds of men leaving employment over the last quarter is 0.081/ 0.919 = 0.088 which is less than 9 in every 100. So the odds of an employed male in Auckland remaining employed through to the next quarter is over 11 to 1, the chances of a *jobless* person remaining jobless is only 0.8 to 1. Those outside the labour force remaining outside have odds 7.7 to 1. The full set of odds ratios calculation from Table 3 is given in table 4.

To summarise: gross flows tell us the number of people

Table 4. Odds in favour of the transition occurring (odds ratios). Males in the Auckland region, quarter 3-4, 1991

	Quarter t		
Quarter t-1	E_t	J_t	N_t
E_{t-1}	11.413	0.029	0.055
J_{t-1}	0.243	0.864	0.517
N_{t-1}	0.065	0.058	7.675

Source: Statistics New Zealand. Special tabulation from the Household Labour Force Survey.

who enter and leave employment, unemployment and enter and exit the labour market from quarter to quarter. Only recently have such three way gross flows been examined at the regional level and then only in passing (see Jones, 1992, 1993; and Jones and Riddell, 1998a and b who draw on Canadian data). Most work at the regional level has focused on flows into and out of unemployment *alone* and almost exclusively by using data collected for other purposes, such as the British claimant counts. Few students of regional labour markets have had access to data that allow them to focus on the dynamics underlying the other two states *employment* and the *non labour force* yet both these flows are central to understanding how labour in different regions adjusts to changes in local demand.

What this illustration of men in Auckland has highlighted is just how dynamic a regional labour market can be; over 14 percent of working age men changed states in this particular three month period. The Auckland example has also drawn our attention to the importance of those outside the labour force, N, who supply and receive labour from the other two states on a regular basis. As economic geographers our concern is with understanding just how these dynamics vary by region and how the different dynamics can alter key rates that we routinely use to judge the employment health of regions. We turn therefore to the method used to draw such conclusions.

Estimating regional labour market risk

In very general terms our aim is to describe how the probability of making any particular transition, p, varies with characteristics of the region (R) after controlling for the conditions (A) in the macro economy (M) and attributes of the individuals which might have a bearing on the probability of transition, that is

$$p = f(R, M, A)$$

Ideally, we would like model the probability of a sampled *individual* moving between labour market states. The availability of grouped data only means we have to confine our attention to the sequence of labour market transitions experienced by men and women in the 10 regions of New Zealand between each of the 53 quarters available over the period 1986 and 1999. We analyse men and women separately which brings the number of observations in each of the two pooled data sets to over 520.[10]

The use of a bounded variable as the dependent variable in a regression framework is subject to a number of well known problems including the estimation of p outside its range, $0<p_i<1$. For reasons that are thoroughly detailed in Wrigley (1985) we transform p into the log of the odds ratio (or) which gives us the linear logit model:

$$(3)\ L = \text{logit} = \log(or) = \log(p/1-p) = \alpha + \beta X_i$$

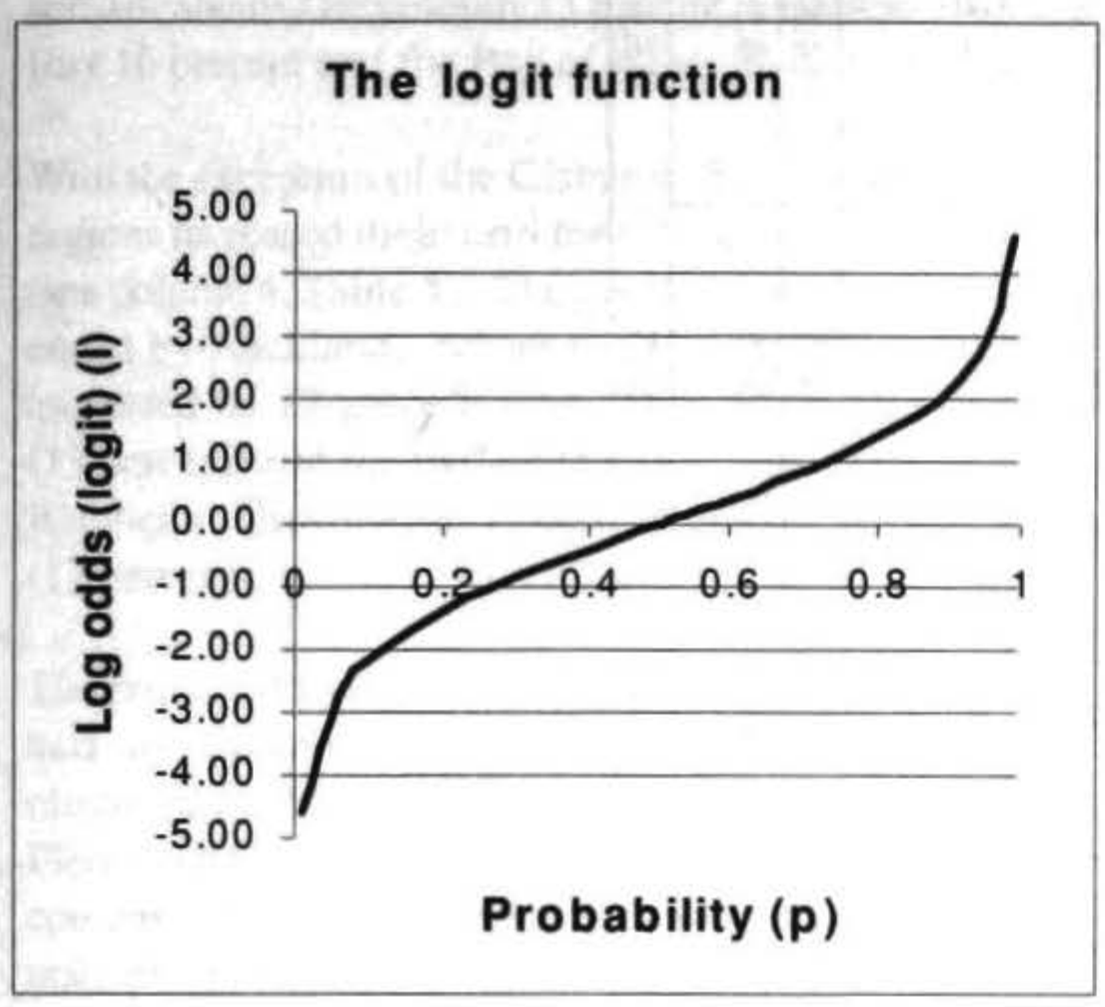
This logit transformation runs from minus to plus infinity as p increases from 0 to 1 as shown in Figure 2. Thus, while the probabilities are bounded, the logits are unbounded. It follows from (3) that

$$(4)\qquad p = e^{\alpha+\beta X} / 1+e^{\alpha+\beta X}$$

so the predicted probabilities can be found by substituting for α and β in the above (Wrigley, 1985: 28-9).

The model we apply to a given transition probability (p_i)

Figure 2. The probability to logit function



is

$$(5)\quad L = \log (p_i/1-p_i) = \alpha + \beta_1 T + \beta_2 C + \beta_2 Q_k + \beta_4 D + \beta_5 R_j + [\beta_6 A] ; i = 1,2, \ldots, 520.$$

where p_i is the i^{th} inter-quartile transition between any pair of states.

The parameters of this model when applied to grouped data are estimated using weighted least squares. The error variance in the linear logit model is not constant for it depends upon the probabilities of occurrence of each response and on the sample size of each subpopulation. Weighted least squares (which minimizes the weighted sum of squared residuals) does not require a constant error variance (homoscedasticity) and is therefore favoured over ordinary least squares (Wrigley, 1985: 31).

Variables

Three variables are used to account for the temporal variability in the transition probablity p_i over the 53 quarters, the trend, cycle and seasonal effects. [11]

T This trend variable refers to the long term growth in GDP over the 14 year period (53 quarters). The trend is positive with units in thousands of millions of current dollars.

C Business cycle. This variable represents residuals from the linear trend T above. [12]

S_k Seasonal dummy variables, k = 1,2,3 with the fourth quarter used as the base.

In order to ensure that the rebasing of the Household Labour Force Survey did not influence our results we included a redesign variable, D.

D Starting in December quarter 1993, the Household Labour Force Survey sample was redesigned using information from the 1991 Census of Population and Dwellings. The last quarter in our series, March 1999, was also rebased using the 1996 census. Rebasing alters the proportions of the sample that are new and can have an influence on the flow probabilities. We have therefore specified D as a dummy variable which takes the value 1 in the rebasing quarters.[13]

Until very recently New Zealand had not been formally divided into local labour market areas (LLMs) the way USA, Britain and a number of European countries have and therefore we had not had the benefit of the wide-ranging comparative analysis which travel to work areas (TTWAs) have received.[14] The New Zealand regions we use here are, in several cases, aggregations of proximate Labour Employment Districts on which the HLFS were originally coded (see table 5). There is a sufficient degree of disaggregation here to classify them into three groups: the metropolitan based regions (m), the provinces (r), and the peripheral regions (y) as shown in Figure 3.

The dominance of the Auckland region within the New Zealand labour market is quite apparent from the relative size of the workforce (col 3 of table 5). Wellington is only 39 percent of the size of Auckland, Canterbury (containing the Christchurch urban area) 43 percent and Waikato (including the Hamilton urban area) 32 percent. The smallest regions in workforce terms are the more marginal regions both geographically and economically: Northland

Figure 3. Regional divisions used in the study of gross flows: New Zealand

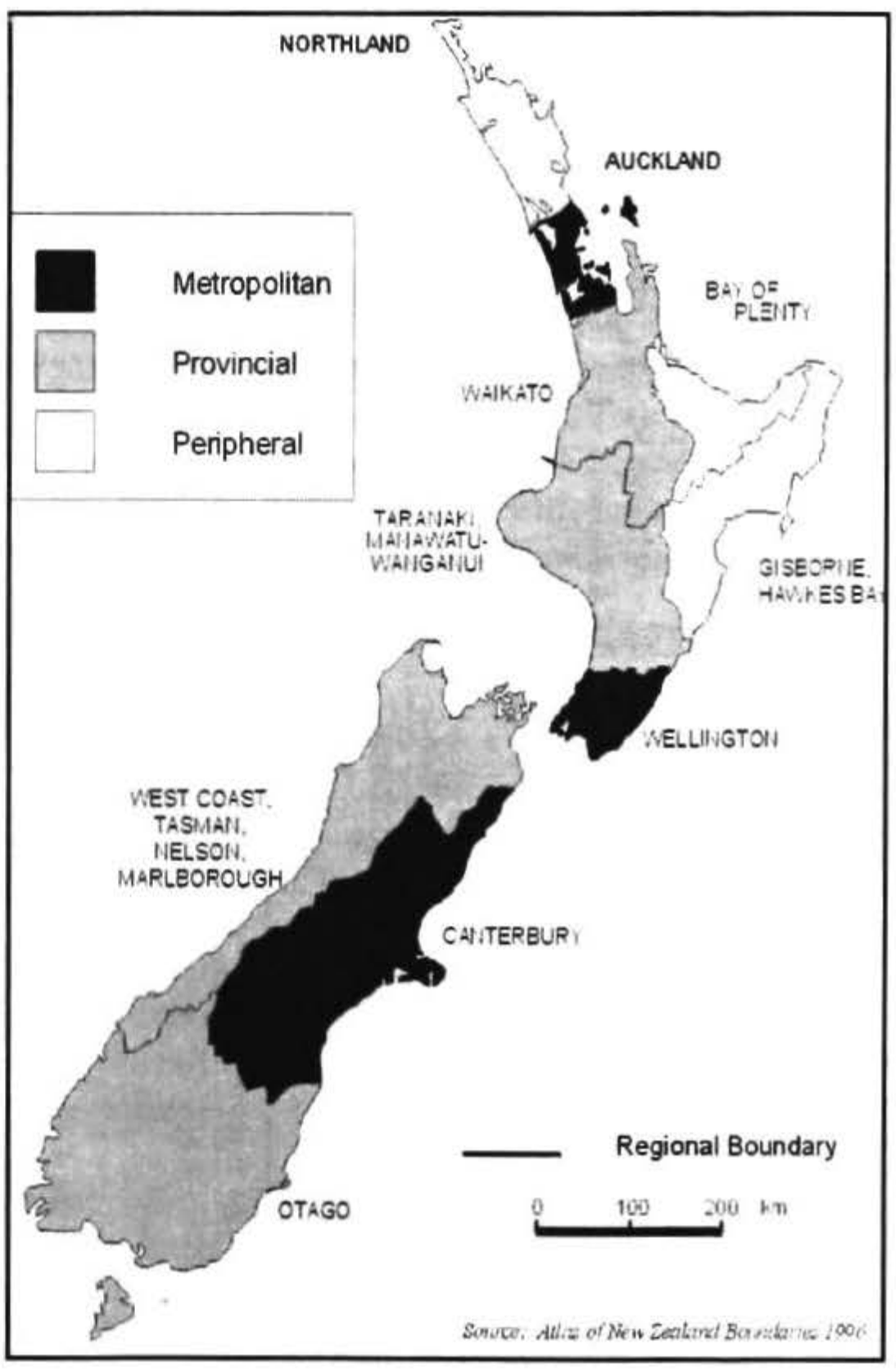


Table 5 Characteristics of the ten New Zealand regions, 1996

Employment District(s)	Region name	Size of workforce relative to Auckland =1	Growth in gainfully employed 1996/1986 1996=1	Percent unemployed %	Percent of gainfully employed in agriculture %	Labour force participation rate (E+U)/ (E+U+N)	Proportion of working age population under 25 years %	Proportion of working age population 50 years and over %	Median income ($'000)
Whangarei	Northland	0.12	1.00	10.8	8.6	69.7	19.4	24.1	13.2
Auckland + Takapuna + Manukau	Auckland	1.00	1.17	7.5	1.0	74.0	22.7	18.8	17.8
Hamilton	Waikato	0.32	1.08	8.1	7.1	75.2	23.6	20.5	15.2
Tauranga + Rotorua	Bay of Plenty	0.20	1.12	10.2	5.3	73.4	20.9	22.7	14.5
Gisborne + Napier + Hastings	Gisborne-Hawkes Bay	0.16	0.99	8.8	7.4	74.4	21.6	21.7	13.9
New Plymouth + Wanganui + Palmerston North	Taranaki-Wanganui-Manawatu	0.30	1.00	8.3	6.3	74.4	23.8	20.6	14.7
Wellington + Lower Hutt + Masterton	Wellington	0.39	1.02	7.5	1.2	76.7	22.2	19.6	19.0
Nelson + Blenheim + Greymouth	Nelson-Blenheim-Greymouth	0.13	1.15	5.7	7.3	77.2	19.8	22.6	14.3
Christchurch + Timaru	Canterbury	0.43	1.13	6.7	3.7	75.9	23.0	20.8	14.8
Invercargill + Dunedin	Southland-Otago	0.26	1.03	6.8	5.9	75.3	24.8	20.5	14.3
NEW ZEALAND		**3.31**	**1.09**	**7.7**	**3.9**	**74.8**	**22.6**	**20.3**	**15.6**

is only 12 percent the size of the Auckland region, Nelson-Blenheim-Greymouth 13 percent, Gisborne-Hawkes Bay 16 percent and the Bay of Plenty 20 percent.

With the exception of the Gisborne-Hawkes Bay area, all regions increased their workforce between 1986 and 1996 (see column 4, Table 5). The greatest growth was experienced by Auckland, where the working age population increased by 17 percent over the decade, in Canterbury (13 percent) and the two quite mixed regions of Nelson-Blenheim –Greymouth (15 percent) and the Bay of Plenty (12 percent).

The primary differences across these regional labour markets are apparent from the remaining columns. Unemployment in 1996 was highest in Northland, the Bay of Plenty and Gisborne-Hawkes Bay (column 5, table 5; the combination in this last region understating the much higher unemployment rate experienced by Gisborne alone). These rankings will come as no surprise to those familiar with New Zealand, for these regions have for many decades experienced much higher than average unemployment rates. By comparison, the metropolitan centres almost always record the lowest average unemployment rates: Auckland and Wellington (7.5 percent) and Christchurch in Canterbury (6.5). Only during periods of unusually rapid growth will unemployment rates in the non-metropolitan regions fall below these levels (as Nelson-Blenheim illustrates). The fragile communities in the West Coast of the South Island (labelled Greymouth in Table 5 and Figure 2) are too small to be identified alone but typically have unemployment rates well above the average both for New Zealand and the wider region into which they have been grouped here.

Although only employing a small percentage of the contemporary New Zealand workforce the agriculture sector nevertheless plays a much larger economic role in some regional economies than others. While relatively high percentages are employed in agriculture in Northland (8.6 percent) and Gisborne-Hawkes Bay (7.4 percent) the proportion is indicative both of a lack of industrial and service sector development as well as a more labour intensive agriculture. In a country like New Zealand with a highly sophisticated agricultural industry, regions with significant agricultural sectors like Nelson-Blenheim [Greymouth] and Otago and Southland can be quite bouyant regional economies and even more so when centred by an expanding metropolitan centre such as Hamilton in the Waikato region.

Our threefold division of the New Zealand region into metropolitan, provincial and periphery is most clearly seen in the labour force participation rates which although spanning a relatively narrow range are strongly negatively correlated with the unemployment rate. These rates are lowest and highest respectively in Northland (69.7 vs 10.8 percent) and Gisborne-Hawkes Bay (74.4 vs 8.8) and highest in the low unemployment areas of Wellington (76.7 vs 7.5 percent) and Nelson-Blenheim-Greymouth (77.2 vs 5.7).

The age structures of the regions can be important in a gross flows context because of the quite different labour market entry and transitional properties of younger and older workers. However the age structures show relatively little difference across the regions with a range from 19.4 percent under 25 years in Northland to 24.8 percent in Southland, (the later inflated by the major tertiary education provider in Dunedin). The peripheral regions have the lowest proportion under 25 years, due to heavy rates of out-migration (Northland , 19.4 percent and Gisborne 21.6) and in Northland's case the highest proportion of over 50s in the workforce as older people have returned (24.1 percent- compared for example to only 18.8 percent in Auckland).

Finally, from table 5, we see how the much higher incomes earned in the metropolitan centres: Wellington ($19 thousand median income per annum), Auckland ($17.8) and Waikato ($15.2) compared with the lower incomes in the high unemployment regions of Gisborne-Hawkes Bay ($13.9) (a figure raised by the inclusion of the richer Hawkes Bay Employment District), and Northland ($13.2).

Even though we acknowledge the internal complexity of each of these regions our data only allow us to represent each region simply by a dummy variable. This means that it is the collective influence of characteristics in table 5 which influence the transition probabilities that we are modelling. Thus, in addition to the explanatory variables listed above, we also include

Rj Regions, j =1, …, 10. Of the 10 regions, 9 are represented as a dummy variable, their estimated coefficients being compared to Auckland =1 as the base.

Finally, we come to the matrix A in equation 5 which would normally differentiate groups according to the attributes of their particular populations. The only differentiation we are able to undertake in this application is by gender and as the literature has shown it is inappropriate to assume men and women experience the same labour market behaviour, the two gender groups are run separately.

Having to be so selective on attributes is a problem imposed by the categorical or crosstabular nature of the data. It is a classic problem for geographical analysis of such data because in order to retain the geographic differentiation one has to sacrifice demographic detail. Similar problems, though often unrealised, are faced by those who examine the effects of age, education and related variables but gain no insight into the quite different workings of different parts of the country because geographic detail is excluded or heavily reduced[15] There is clearly a trade-off in both cases.

In summary, in exploring variation in transition probabilities (p_i) we have constructed a pooled data set of transition probabilities (time series x cross section) and speci-

fied a model which estimates the fixed effects of individual regions once the growth trend, cyclical and seasonal effects (and periods of sample rebasing) have been introduced. [16]

Regions and the risk of leaving employment

The probability of leaving employment in any region between any two quarters is estimated as follows:

(4) $p = (EJ + EN) / (EE + EJ + EN)$

as these terms are defined in Table 1.[17]

The influence of economic growth

The experience of men in table 6 shows quite clearly how the risk of leaving paid work fall with the size of the regional labour market. The odds of leaving employment are much higher for those working outside the two main metropolitan centres of Auckland and Wellington. This result echoes the findings of Grimmond (1993) who found greater employment stability in the three older metropolitan regions for the period 1986-1991.

Workers show increased risks of leaving employment in Canterbury and Waikato, the other two regions with large urban centers. Risks rise again in the Bay of Plenty region then jump markedly for workers resident in the smaller more peripheral employment districts. In the Nelson-Blenheim- Greymouth region the odds of leaving employment between quarters is nearly one fifth higher than Auckland, in Northland a third higher and in Gisborne-Hawkes Bay nearly two fifths.[18]

Such results are quite consistent with those who argue that agglomeration economies benefit labour by increasing the number of jobs available at any one time (e.g. Glaeser, 1994). Given a fixed turnover rate, labour in these larger denser markets can move relatively seamlessly from one job to another without major interruptions in the income stream. Large urban labour market environments engender greater security which encourages higher turnover rates ensuring that the range of jobs available over time remains high. This same characteristic of large urban areas also encourages high levels of migration between them (see Cordey-Hayes, 1978).

A comparison of the results for men and women in table 6 highlight the much greater risk that residence in the smaller provincial regional labour markets impose on men.[19] Interestingly even though the service sector in which the majority of women are employed is far more evenly distributed across the regions and than manufacturing or agriculture the ranking of the regions in terms of risk for women leaving employment remains the same as that for men.

Employment risk as measured by separations is sensitive both to expansion and contraction in the national economy as well as to the size of the local labour market. Whereas the probability of women leaving employment remains fairly stable over the 15 year period, the coefficient on the trend variable shows that the odds in favour of males leav-

Table 6. The influence of region of residence on the (log) odds of leaving employment by quarter, males and females, 1986-1999. Weighted least squares. Base = Auckland, quarter 4, 1991

	Males				Females			
Variable	Log odds	Odds	t statistic	p>0.05	Log odds	Odds	t statistic	p>0.05
Constant	-1.519	0.219	-13.12	*	-2.826	0.059	-21.591	*
Trend	-0.049	0.952	-8.516	*	-0.009	0.991	-1.364	
Cycle	-0.014	0.986	-1.176		-0.095	0.909	0.005	
Quarter 1	0.108	1.114	4.215	*	0.016	1.016	0.511	
Quarter 2	-0.002	0.998	-0.08		0.025	1.025	0.862	
Quarter 3	-0.037	0.964	-1.336		0.0001	1.000	0.005	
Redesign	-0.026	0.974	-0.822		-0.057	0.945	-1.51	
Northland	0.289	1.335	5.824	*	0.201	1.223	3.695	*
Waikato	0.096	1.101	2.877	*	-0.029	0.971	-0.754	
Bay of Plenty	0.115	1.122	3.096	*	0.039	1.040	0.928	
Taranaki-Wanganui-Manawatu	-0.128	0.880	-3.512	*	-0.196	0.822	-4.773	*
Gisborne-Hawkes Bay	0.332	1.394	8.732	*	0.148	1.160	3.392	*
Wellington	0.001	1.001	0.049		0.007	1.007	0.206	
Nelson-Blenheim-Greymouth	0.172	1.188	4.027	*	0.007	1.007	0.156	
Canterbury	0.095	1.100	3.382	*	-0.011	0.989	-0.0369	
Southland-Otago	0.117	1.124	3.479	*	0.116	1.123	3.208	*
Adj R-squared	0.358				0.206			
No of obs.	520				520			

Source: Statistics New Zealand, Household Labour Force Survey. Special tabulation.

Table 7. The influence of region of residence on the (log) odds of those leaving employment and withdrawing from the labour force, 1986-1999; controlling for economic growth, cycle, seasonal and sample redesign effects. Weighted least squares logit estimates. Base =Auckland, quarter 3 and 4.

	Males				Females			
Variable	**Log odds**	**Odds**	**t statistic**	**p>0.05**	**Log odds**	**Odds**	**t statistic**	**p>0.05**
Constant	2.009	7.456	9.011		0.807	2.241	3.342	*
Trend	-0.059	0.943	-5.306	*	-0.049	0.952	-4.092	*
Cycle	0.180	1.197	8.149	*	0.261	1.298	10.783	*
Quarter 1	0.067	1.069	1.388		0.333	1.395	6.171	*
Quarter 2	0.228	1.256	4.302	*	0.512	1.669	8.887	*
Quarter 3	0.213	1.237	4.060	*	0.381	1.464	6.661	*
Redesign	-0.068	0.934	-1.161		-0.034	0.967	-0.495	
Northland	-0.226	0.798	-2.421	*	-0.122	0.885	-1.233	
Waikato	-0.194	0.824	-3.085	*	-0.128	0.880	-1.840	*
Bay of Plenty	-0.361	0.697	-5.310	*	-0.175	0.839	-2.280	*
Taranaki-Wanganui-Manawatu	-0.488	0.614	-7.300	*	-0.563	0.569	-7.343	*
Gisborne-Hawkes Bay	-0.283	0.754	-4.066	*	-0.350	0.705	-4.392	*
Wellington	0.029	1.029	0.159		0.800	2.226	1.349	
Nelson-Blenheim-Greymouth	-0.218	0.804	-2.698	*	-0.013	0.987	-0.147	
Canterbury	-0.083	0.920	-1.547		0.011	1.011	0.187	
Southland-Otago	-0.264	0.768	-4.185	*	-0.263	0.769	-4.009	*
Adj R-squared	0.258				0.312			
No of obs.	520				520			

Source: Statistics New Zealand, Household Labour Force Survey, Special tabulation

ing employment *fell* by 5 percent for every unit increase in the linear GDP growth trend over the 14 year period.

Notwithstanding our use of an estimated linear trend in GDP, economic growth was far from steady over the 1986-1999 period; in fact this was quite a tumultuous period in New Zealand's labour history (see Morrison, 2001). GDP fell below its trend through the period 1986 to 1992, rose at a declining rate between 1993 and 1998, then fell over the last few quarters in 1999. The unemployment rate tracks the quarterly GDP series very closely, rising as the economy enters a recession and falling as the economy grows again.

Whereas men's job stability appears to be more sensitive to the longer term structural change in the economy, women appear more affected by these short term cyclical fluctuations in part because the much higher proportion are in part-time work. Seasonal effects on the other hand mainly affect men, with the odds of leaving employment increasing significantly at the end of the calendar year.

Employment risk has been used so far to denote employment separation or quits. While the term can be used solely in this way it is also useful to look at the way that risk affects subsequent search behaviour. While the positive link between employment instability and the unemployment rate across regions is reasonably well documented in the literature, the way that this is mediated by the actual search for work has received much less attention.[20]

The argument we now wish to advance is that employment risk affects the unemployment rate in two ways: first by increasing the pool of likely unemployed and the second by increasing the proportion who will be classified as unemployed because they have to search actively for replacement work. The first affects E to U flows, the second U to N flows. The two are mutually reinforcing and, when they work together, they widen the spread of unemployment rates observed among regions. We now turn now to the supporting empirical evidence.

Leaving employment and the labour force

What happens to those who leave employment? Do they remain in the labour force as active searchers (the officially unemployed) or do they simply withdraw from the labour force? We use the same general model as in equation 2 and we estimate the *conditional* probability of leaving the labour force. In other words we estimate the conditional probability in which p is the likelihood of someone engaged in paid work in one quarter withdrawing from the labour force in the second; see equation 5. By using the jobless instead of the unemployed we are constructing a more challenging test because the jobless include not just those who have taken active steps in the last four weeks to find work but also those who while available for work but are not actually seeking work *and* those are actively

searching but are not immediately available for work.[21]

(5) $p = EN / (EJ + EN)$ [22]

As a guide to the magnitudes involved here, if we substitute the Auckland figures from table 2 into (5) we find that 65 percent of those men leaving employment in Auckland subsequently withdrew from the labour force by the next quarter: 0.65= 7.5/11 =67.5/(4.1+7.5). This implies that only 35 percent of those leaving employment actually searched for replacement work as unemployed. The remainder withdrew from the labour force altogether.

The results of estimating this conditional logit model, equation 5, on the two pooled data sets are given in table 7.

Temporal effects

Economic expansion means more jobs and therefore reduced search costs and, because of the competition for labour, possibly higher wages. While the opportunity cost of not working rises during expansions the greater chance of actually securing a job at an acceptable wage actually removes some of the pressure to actively search. Therefore the perceived risks of withdrawal from the labour force diminish with economic expansion.

The results show that those periods of cyclical growth (in which the increase in GDP exceeded the general trend) were indeed associated with a *greater* likelihood that both men and women would withdraw from the labour force. The cycle coefficients show that the odds of withdrawal increase by 20 percent for men and nearly 30 percent for women for every unit upturn in the cycle.

This is not the first time this argument has been put forward. In an earlier study based on the 1986-1991 series from the same source David Grimmond noted that, "There appears to be a pro-cyclical pattern to the probability of entering the peripheral labour force", and that "This might represent relaxation of job search effort as job prospects improve from labour participants..."(Grimmond, 1993: 59). Grimmond's peripheral labour force consisted of those individuals who were either available for work but not seeking work or seeking work but not immediately available for work i.e. the numbers added to the unemployed to make up the jobless. What our evidence suggests is that it may not simply be withdrawal into the peripheral labour force (which have been incorporated into our jobless category) that occurs during periods of growth, but withdrawal into the deeper recesses of the non labour force as well.

Withdrawal from the labour market reduces the inflow (from E) into the stock of U. Therefore those leaving employment during cyclical upturns actually lower the unemployment rate and in so doing increase the amplitude of the cyclical swings in that rate. On the other hand, when recessions occur, the employed who leave their job are more likely to move into active searching which causes a greater inflow (from E) into the stock of unemployed thus pushing unemployment rates higher in the recession. Confidence in the market and its effect on search behaviour therefore exacerbates the temporal swings in the unemployment rate.

One of the reasons for discussing this cyclical effect on job search is that we want to show how the same argument holds when we apply it to the spatial domain. If the local labour market played no role in modifying search behaviour following employment separation then the decision to actively search would be quite random throughout the country. Our results suggest otherwise. Just as when the demand for labour rises over time, so in regions where market demand for labour is strong there is greater confidence in the market and a reduced need for active searching. We find in table 7 for example that men in the two large high wage labour markets of Auckland and Wellington behave very similarly to those in the other major metropolitan centre, Christchurch. Just as withdrawal and passive searching is a more likely response to upturns in the business cycle so withdrawal from the labour force following employment is much *more* likely in stronger metropolitan markets where the chances of getting a job are higher. For the same reason as the unemployment (jobless) rates are exaggerated over time, so too are search reactions thus widening the gap in unemployment rates between strong and weak regional labour markets.

By contrast when we look at those who leave employment in the smaller more 'risky' regional local labour markets we find that men are far *less* likely to actually withdraw from the labour force.[23] The odds of employed males leaving the labour force in all the non-metropolitan regions are significantly lower than in Auckland, ranging from 0.82:1 in the Waikato through to 0.62:1 in the Taranaki-Wanganui-Manawatu region.

The fact that the tendency to withdraw is much higher for women than it is for men, both in response to temporal as well as spatial differences in markets, probably reflects the more buoyant employment opportunities for women – as well as the traditional 'shelter' function the domestic economy provides. The region of residence however also impacts on women with roughly the same odds although the statistical significance is lower, possibly because their already higher labour force withdrawal rates.

In summary it does not seem to matter whether these market conditions are temporal or spatial, they generate the same effect, namely that the active searching for work which unemployment (and to a lesser degree joblessness) measures is less likely to be used as a way of getting back into work in robust labour markets than it is in soft, vulnerable markets.

Such evidence runs counter to the discouraged worker thesis -the notion that labour will be *reluctant* to actively search if it lacks confidence in actually securing work.

The discouraged worker argument was formulated after empirical observations of the behaviour of the labour force participation rate under different economic conditions (see Bowen and Finegan, 1964, 1969). The evidence that *regional* labour markets with high unemployment rates also exhibited low labour force participation rates subsequently became one of the most well established empirical relationships in the labour market literature, both internationally (Long, 1958; Mincer, 1966; Bowen and Finegan, 1969; Clark and Summers, 1979), and in New Zealand (Hyman, 1978 and 1979; Poot and Siegers, 1992; Morrison, 1999). At the same time there have been prominent detractors, notably Mincer (1966) and Wachter (1972), who in addition to preferring a wage rather than job opportunity driven labour supply curve could also point to *time series* relationships that offered nowhere near the strong statistical evidence which cross sectional estimates based on comparing regions could produce (see also Fleisher and Rhodes, 1976). The inference was that the evidence used to support the discouraged worker hypothesis may have been based on structural differences across regions rather than reflecting a behavioural response.

Access to gross flows data and the ability to model conditional probabilities actually offers a more refined test of the discouraged worker effect because of the way it allows us focus on behaviour at the margin and in this case *solely* on those who leave employment. Flows data contrast with the more commonly used labour force participation *rates* which are based *all* labour in employment and unemployment (i.e. E+U / E+U+N). This use of stock as opposed to flow measures reinforces our scepticism over the *behavioural* (discouraged worker) interpretation of the negative relationship between the participation and unemployment rates when estimated from regional data. At the same time, flows data are not without problems of their own as the following discussion indicates.

Discussion

While the release of gross flows data has undoubtedly increased our understanding of both the magnitude and direction of the dynamics of the labour market it has also opened up panel data to closer scrutiny and it is appropriate therefore to raise the concerns expressed over their reliability. Although the empirical patterns identified in our research are quite plausible both in terms of our own understanding of the *geography* of the New Zealand labour market, its *macro* behaviour, the degree to which errors which accumulate in panel data collections might bias these results is as yet unclear.

In estimating the risk or hazard of moving from one labour market state to another we face two types of errors, those generated by sample attrition and those resulting from respondent error. Sample attrition refers to the fact that individuals can drop out of the survey before the two years is up. From the British experience with panel data we know that the rate of attrition is especially high for young adults, single people (i.e. never-married and not cohabiting), those in privately rented accommodation, the unemployed, and in those in temporary employment (Office of National Statistics, 1997: 2).[24]

Two important things happen when we shift our attention from gross flows at the national level to gross flows at the regional level. Firstly, the counts become smaller and the sampling errors relatively larger. Statistics New Zealand already advise that most of the quarterly survey estimates at the national level are *within* the bounds of associated sampling error intervals. The same warning obviously applies with greater force to the regional estimates as well.[25] Similar caveats apply of course when the samples are further subdivided into other groups such as by age or education.

The second point is quite specific to regional disaggregation. The New Zealand Household Labour Force Survey, like most of its counterparts elsewhere, is based not on individuals but on dwellings; in otherwords it is a *household* survey. Interviews are nevertheless conducted with individuals (sometimes with one answering on behalf of another). This means that if an individual leaves the household (dwelling) before the two years is up then that individual is lost to the sample.

Of special relevance to understanding the way labour market conditions in the different regions affect employment related behaviour is the way in which regional estimates from panel studies might be affected by sample attrition. If individuals who change dwellings between quarters are lost to the sample then so too are interregional migrants (as well as those who move *within* the region). It is possible therefore that differential mobility rates across regions might be associated with different levels of attrition bias. Other things equal, any event that jointly increases residential mobility *and* movement in and out of the labour force and/or employment, such as the closure of a major employer in the region, will exaggerate the transition rates within the gross flows matrix.[26] To the extent that migration out of the region is more likely for certain demographic groups such as the young, then regions with a younger age structure may be more vulnerable to such composition bias. In the absence of any adjustments for *mobility* induced change to the transition probabilities such attrition errors will simply become part of the unexplained variance.[27]

Although not totally allaying our concern over the inability to explicitly include mobility responses in the analysis of flows it is also worth noting the finding by the UK study regarding the effect of region on sample attrition ambiguous The Office of National Statistics (ONS) concluded that, "there is no significant biasing effect arising from the loss from the labour force sample of people moving away from their present address" . While they did find that people moving away from their present address (and thereby lost to the sample) *were* more likely to change their economic activity category, such "movers make up such a small proportion [and] overall the effect on the whole sam-

ple is negligible" (ONS, 1997: para 24).[28]

Geographic mobility will also affect the extent to which the matched sample – those remaining in the survey across eight quarters – is representative of the full household labour force survey sample. After investigating this question, Woolf (1989, pp 34-5) found that rotation group errors had little effect on the match between the gross flows estimates of employment and the full sample survey estimates - although the matched sample, consistently *under*estimated the number unemployed and *over*stated the number of people not in the labour force (cited in Silverstone and Gorbey, 1995: 54 (my emphasis)). In general however Woolf believes that, subject to some cautions with respect to measurement error, timing and weights, it *is* reasonable to assume that the characteristics of the persons in the unmatched sample *are* the same as those in the matched sample. In short, sample attrition does not appear to be a problem in the study of risk from panel data. More serious are the errors generated through the respondent and coders missclassifications of labour market state.

Classification error refers to the respondents' incorrect identification of the labour market state they are in, for example whether they are unemployed or no longer in the labour force. One of the reasons for concern here is that response errors are compounding. For instance, a person employed for all seven quarters if misclassified as unemployed in quarter three will lead to two spurious transitions, first from employment to unemployment, then back from unemployment to employment in the succeeding. Such misclassifications of status can lead to multiple spurious transitions although the effect on the stocks of multiple misclassifications can be partly offsetting (see Jones, 1993:2). Such misclassifications have been identified by comparing stated changes in category with stated durations in those categories. The UK statistical office, for example, argues that a substantial proportion of such transitions are inconsistent with the length of time in the category reported at the second interview and that these inconsistencies are more likely between the first two interview waves than between later interviews (ONS, 1997:3; also see Meyer, 1988).[29]

Views on the importance of classification or response error vary. A conservative approach has been taken by the UK statisticians who conclude that, "Until a satisfactory method for adjusting for response error bias is developed, we do not propose to publish gross flows data, and will warn users of longitudinally linked data sets against producing them" (ONS, 1997: 3). [30] Other agencies such as those in Canada and New Zealand have been more willing to release gross flows at the regional level with these caveats in order to learn from the explorations of researchers themselves.

While access to gross flows undoubtedly increases our understanding of what is going on within particular regions, it remains incomplete without knowledge of the flows of labour to and from regions (and ultimately to and from overseas). By treating each region as if it were an independent identity as we have done above, we lose sight of the fact that the behaviour of each 'regional labour market' is highly constrained by developments in labour markets elsewhere in the country.[31] If we were able to combine gross flows across labour market states with the (often simultaneous) adjustments people make when they extend their travel to work or migrate to another region, we would be in a much better position to understand labour adjustment within what would be an integrated geographic framework.[32]

In this New Zealand study we have attempted to reduce the possible influence of classification error by defining unemployment more broadly as 'jobless' rather than simply the 'unemployed'. In addition to reducing classification errors the jobless count is almost twice the unemployed count, which also serves to reduce the sampling error particularly in the smaller regions.[33]

Future Research

It is quite apparent from the results of the linear logit analysis above that, although we have successfully identified both temporary and regional effects on the odds of transitions occurring, these variables alone have only accounted for about one third of the variation experienced by the 520 groups in our pooled sample. Other influences are present which future research must identify and take into account. The literature on national studies would suggest that at least some of this unexplained variation is likely to be due to composition effects. It is possible for example that *some* of the effects we have attributed to the regional labour market may well be due to the attribute mix of their working age populations rather than simply the effect of local labour demand conditions. Even though we have shown in table 5 that the differences in average ages across the regions is very narrow we suspect that in the case of regions which have remained at the periphery for many decades that withdrawal and net out-migration over the years may have altered the composition of the regions' working age population in ways we have not identified here. [34]

In order to adequately identify the relative role of supply and local demand attributes on the geography of labour market transitions, data would have to be obtained at the individual level and the modelling effort shifted from linear logit fitted to categorical data to the estimation of multinomial logit models on micro or individual level data.[35] This would also give access to a much larger sample rather than the restricted number of groups typically found in categorical data sets.

Much of the concern over gross flows data is that many counted changes of state are due to reporting errors. Access to the anonymised individual records would open up the opportunity to follow individuals over *more* than one quarter up to a maximum of eight quarters. It would also allow some very short spells to be identified as possible reporting errors.

One of the difficulties geographers face in dealing with longitudinal surveys is the absence of geocoding. One of the potential advantages of geocoding sampled dwellings for example would be that the researcher would no longer be locked into preset and often arbitrary regional or local labour market divisions, but could isolate their own spatial clusters to test specific geographic effects. The isolation of labour catchments with particular labour demand characteristics for example would have distinct value in testing arguments about the labour adjustment responses of individuals facing particular local conditions.

Our focus in this chapter has been on gross flows but there are two important aspects of regional labour demand which need to be integrated into an extended analysis of labour market dynamics: job opportunities and wages. Considerable progress has already been made internationally on the impact of job opportunities or vacancies on labour flows (see for example Davis, Haltiwanger and Schuh, 1996; Burda and Wyplosz, 1994) with much of this work being done within a matching function framework (e.g. Burgess, 1994). Far less attention has been paid within a gross flows context on the role of wages, particularly local wages in inducing transitions and there is clearly room for integration of questions which have driven the wage curve debate into the regional gross flows literature (see Blanchflower and Oswald, 1990 and Morrison and Poot, 1999).

Not all progress in understanding labour dynamics at the regional level is dependent on the release of microlevel data. There are still questions concerning the boundaries between the unemployed and those classified as outside the labour force which need exploring. Steps taken on the New Zeaalnd data to identify a 'peripheral' labour group sitting between the official unemployed and the rest of those outside the labour force could usefully be applied to regional data in order to better understand labour adjustment behaviour in regions experiencing quite different demand conditions. So far the development of such a four-state transition matrix has only been applied at the national level (see Jones and Riddell, 1998). The Household Labour Force Survey classifies individuals according to the reasons those not employed or unemployed have not been looking for work in the last four weeks. The integration of these data into a suitable model should allow a clearer identification of the association between lack of participation, individual attributes, and characteristics of regional labour markets.[36]

Conclusions

The underlying dynamics of regional labour markets experiencing markedly different demand for labour can be exposed by gaining access to gross labour flows for each region. New Zealand remains one of the few countries which has released these data for research purposes and the exploratory analysis reported in this chapter has been is based on the quarterly gross flows data within 10 regions over the 53 quarters from 1986 to 1999. The odds of leaving (and entering) employment have been estimated via a linear logit model using fixed regional dummy variables, controlling for trend, cyclical and seasonal effects. Separate estimates were made for men and women.

The results are instructive. They show that there are substantial geographic differences in the risk of breaking the income stream by leaving employment, being lowest in the large metropolitan markets and rising sharply in the smaller, provincial and peripheral labour markets outside the main centres. Such a result supports the conclusions of those who have studied the dynamics of *un*employment, namely that it is regional variations in the *inflow* to *un*employment which set the weaker regions apart from the stronger, metropolitan centres. What this paper has argued in addition however is that differences in regional unemployment rates are affected not only by differences in employment risk but by subsequent job search strategies as well. We have argued that those leaving jobs in weaker markets are more likely to use active job search strategies in order to get back into employment than metropolitan dwellers who can afford to adopt a more relaxed search strategy simply because they face large number of jobs and higher job vacancy rates. The need for those in peripheral regions to search more actively raises inflows into unemployment in those regions at the same time that reduced risk in metropolitan regions allows more of those leaving employment to withdraw from the labour force and hence unemployment. The joint effect is to widen unemployment rates across the regions.

Far from identifying behaviour consistent with the discouraged worker hypothesis, we are arguing that withdrawal actually reflects a *confidence* in the labour market (whether locally or by time period) rather than disillusionment. Rather than those workers in weak, provincial, smaller labour markets, or in periods of negative employment growth, being *more* likely to withdraw from the labour force as implied by the discouraged worker 'effect', we find that individuals in these regions are more likely to actively search and therefore be classified as unemployed. Therefore it is not merely the actual risk of leaving employment which differentiates regional labour markets, but the way the psychology of risk itself modifies job search behaviour and affects flows into unemployment and thereby widens unemployment rates across the regions.

Acknowledgements

This paper was begun while the principal author was a visiting scholar at the Department of Geography, University of Cambridge between October 1999 and January 2000. An early draft was prepared for presentation at the Labour Market Geography session of the IBG/Royal Geographical Society in Brighton, January, 2000. The authors wish to thank the Department of Labour for funding the data for this project and John Scott of Statistics New Zealand for his advice and support. An preliminary draft of the paper was presented at the Economic Geography session of the New Zealand Association of Economists meet-

ing in Wellington, July, 2000 and I wish to thank the discussant, Jacques Poot for the helpful comments he made on the paper. Any responsibility for the paper in its final form is of course the author's alone.

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Notes

[1] The concept of risk as it relates to the labour market has also recently been explored by Reimer (1998) who traces the implications of risk on work patterns and by Munro (2000) who addresses the perception of employment risk as it affects housing purchase decisions.

[2] Some of the basic ideas canvassed by these papers can be traced back much earlier, see Singer, (1936).

[3] Ann Green's work on the UK for example showed that regions with high unemployment rates experienced *both* higher inflow *and* lower outflow rates and therefore reflect *not* so much distinguishing characteristics of workers as the level of local labour market demand in the region (Green, 1986:53). Earlier, Armstrong and Taylor (1983) in their examination of travel to work areas in the North-West region of Great Britain found that some areas had relatively high unemployment rates because their mean *duration* of unemployment was high, whereas other localities had a relatively high unemployment rate because their mean *inflow* was high. Martin and Sunley focus their attention on the overall differentials between the regional and national unemployment rates and decompose this differential into the proportion attributed to inflow and outflow rates. They then contrast the relative importance of the inflow and outflow rates in accounting for the differential between a region's unemployment rate and that of the UK show how these differences changed as the UK moved from the 1986 recession through to the recession of the early 1990s. They found inflow rates to be more important in the north whereas outflows were more important in the south. While this geographical difference was important in accounting for the differentials in the mid 1980s they diminished into the 1990s as the difference in unemployment rates across the regions declined (Martin and Sunley, 1999: 536ff). Following the decomposition used by Gorter, Nijkamp and Rietveld (1990), Morrison and Berezovosky, (2000) use the New Zealand evidence to show how regions with similar unemployment rates can vary considerably with respect their component inflows and duration.

[4] The sample was redesigned in 1990 and there is now missing data for all gross flows between March and June quarters of 1990. In 1991 the sample size was reduced from 24,000 to 16,000 dwellings due to financial constraints and 1993 the survey was redesigned taking into account the final results of the 1991 census (Wood, 1995:15).

[5] Sometimes Statistics New Zealand increase the rate at which they rotate houses in and out of the sample so the overlap rate can be less than 7/8ths.

[6] These figures are sample counts multiplied up to their estimated population totals. Sampling errors are discussed later in the text.

[7] This figure excludes those who were employed in both quarters but changed jobs and made other forms of adjustment while still employed. These data also do not include those who changed residence within the two year period.

[8] A similar point about the general structure of transitional probability matrices was stressed by Forster (1984) after his analysis of the Australian evidence.

[9] Note however that this argument only applies between quarters. It is possible that such individuals may actually search for a short period immediately after they leave employment (or even before hand) but after an unsuccessful search decide to withdraw, which is the state they report when next interviewed.

[10] The sample was redesigned in June 1990 leaving too few observations to allow estimates to be made in that year which reduces the sample size to 520 from 530. These missing observations are not interpolated (as carried out by Grimmond, 1993a).

[11] Here we follow the approach adopted by Jones (1992).

[12] Our choice of a national cycle series was based on a comparison of several contenders: GDP series (GDP), the NZIER quarterly Survey of Business Opinion (QSBO) and the Capacity Utilisation Index (CU). Grimmond had earlier faced the same task in analysing the HLFS series 1986-1991 (The shortness of his series prevented his analysing seasonality). He chose to use the CU series over the GDP mainly because, the "implied labour force relation with the GDP cycle often contradicted intuitive views of cyclical labour market behaviour" (Grimmond, 1993a: 26). It is true that over this period the GDP series did fail to represent the 1988/89 fall in the unemployment rate and the CUBO series showed a much closer relationship. After undertaking these comparisons on data spanning the much longer 1986 – 1999 period however we found that the expected 'intuitive' relationship between GDP and the unemployment rate was reestablished. Moreover, these two series correlate (negatively) over time much more closely and consistently than the unemployment (and jobless) rates do with the capacity utilization series which Grimmond uses. On this basis we chose the GDP series.

Table 8 Sampling standard errors for transition probabilities. Males in the Auckland region, quarter 3-4, 1991

	Quarter t		
Quarter t-1	**E_t**	**J_t**	**N_t**
E_{t-1}	**0.006**	0.004	0.009
J_{t-1}	0.026	**0.023**	0.048
N_{t-1}	0.010	0.008	**0.015**

Sampling errors for the other regions are available on request.

[13] Starting in the December quarter 1993, the HLFS sample was redesigned using information from the 1991 Census of Population and Dwellings. The new sample was phased in gradually to enable a smooth transition. One-quarter of sample households were replaced with one-quarter of the new sample. This process continued for four quarters, so that in the September 1994 quarter the sample consisted solely of households selected from the new sample. This means that rather than the usual one eighth of the households being rotated out, there was one quarter being rotated out each quarter for the four quarters in question. The final quarter of the data in the series (March, 1999) suffers from a similar problem because this quarter was redesigned using information from the 1996 census. Again, rather than the usual one eighth of the households rotated in and out, two eighths were used until the new sample has been completely phased in (Hamish Wilson, Statistics New Zealand, personal communication, 15/7/99).

[14] In the year following this conference, Jamie Newell and Kerry Papps undertook the first partitioning of New Zealand into 14 local labour market areas (see Newell and Papps, 2001). A useful review of local labour market regionalisation may be found in Cadado-Díaz (2000).

[15] So for example Herzog in his 1996 analysis of data from this same survey included a number of attributes excluded here but was unable to also include any geographic detail.

[16] A range of interaction effects were also estimated but as Jones (1992) found for the Canadian case they tended to be idiosyncratic in nature.

[17] We do not distinguish between voluntary and involuntary quits as done for example by Herzog (1996). Based on this literature (e.g. see Jones and Martin, 1986), it is likely that there are systematic variations in proportions of these two types of quits across regions and that this variation could in fact influence the decision to withdraw from the labour force or to start actively searching. This is clearly an area in which to extend this analysis.

[18] One of the reasons particular regions might appear to exacerbate employment risk is because of the coincidence in that region of interaction effects between spatial and temporal effects e.g. the unusually high presence in a region of seasonal sensitive industries. After testing the full range of these we concluded that interaction effects only play an idiosyncratic role. Although some interaction effects do turn out to be statistically significant it is probably true that, like Canada, very little if any of the impact of living in a region is due to any particular local cyclical or seasonal effects on employment (Jones, 1993).

[19] The overall risks of leaving employment are much higher for women (as a comparison of the two constant coefficients shows) and this is undoubtedly due to their higher propensity to undertake part-time work.

[20] Although see Forsythe (1995) and also the discussions in Ackerlof, Rose and Yellen (1988), Bailey (1977), Feldstein (1975) and Mattila (1974).

[21] This leaves open the possibility of constructing a further test of the hypothesis just using U instead of J. A model in which p = EN/(EU + EN) would yield a higher value of p and hence a lower 1-p.

[22] The link between the conditional and unconditional probabilities in this case is EN/(EE + EJ + EN) = EN/(EJ + EN) x (EJ + EN)/(EE + EJ + EN).

[23] Levels of labour force participation in such regions are already low and dependency on the employed is therefore very high. The pressure to remain actively searching as unemployed (and to draw the unemployment benefit) is correspondingly high (Morrison, 1999). Although Herzog (1996) identifies a greater tendency for this same behaviour to be characteristic of Maori men (particularly prime age males), there is no evidence to suggest that those *regional* markets (Northland and Gisborne) where proportions of Maori men are highest are any more likely to opt for unemployment.

[24] Herzog notes for the December 1986-December 1994 period that the mean match rate within the New Zealand sample was 72.6 percent and that matching was higher for "older as opposed to youthful and prime-age workers, and lower for women in comparison to men. In addition, the match rate tended to be higher among workers holding school qualifications, among married individuals, and between September and December of each year" (Herzog, 1996: 5). Temporal variations in matching rates were also observed.

[25] Population estimates of gross flows are released by statistical agencies on the understanding that users take into account the likely errors involved in generalising from samples. The standard errors for each of the nine transition probabilities in Table 2 are given here in Table 8 which shows quite clearly how the errors expand the less likely the transition. Even in a large market such as Auckland some of the relatively smaller flows are accompanied by relatively large standard errors. Relative sampling errors (RSE= 1.96 * (SE/Estimate) * 100) in this case range between 1.23 in the case of EE to 32.82 in the case of EN. Needless to say such errors increase as the size of the region decreases.

[26] To the extent that residential mobility and labour market transitions vary systematically with the business cycle the bias in the transition probability matrix will be systematically related to the cycle. The problem here is not just one that affects flows, but also the stocks estimated from the survey and hence the estimates of the transition probabilities. There is anther aspect to this which may be of even greater significance and that is the now well established hierarchy of labour market adjustment response in which reaction to shocks to regions stimulate firstly (and in terms of magnitude) migration, then labout market withdraw, then least of all unempployment (see Blanchard and Katz...).

[27] It may be helpful at some point to identify the number in each labour market state lost to a region's sample before the seven quarters is up. Even though we will not learn whether they changed states *after* they left the sample we can at least identify the number of cases in the quarter *before* they left. Identifying the prior labour market states of those lost to the sample (for what ever reason including death) *is* possible except that in any population estimate such cases would be weighted in the quarter of their departure according to the weights use in the quarter they were last observed (John Scott, Statistics New Zealand, per com).

[28] Although intuitively we expect them to be linked, tying down the relationship between residential mobility and labour mobility empirically is not straight forward. The study by Clark and Withers is one of the more explicit attempts (although also see Detang,-Dessendre and Mohlo, 1999). This study is based on the US Panel Study of Income Dynamics (PSID) since 1988 when changes of jobs (as opposed to movement in out of the labour force) were collected. These changes are then related to intra-urban movement (as opposed to inter-metropolitan and inter-regional migration). Clark and Withers found that in aggregate, "a household that had a job change is 2.4 times more likely to change residence than a household that did not have a jobs change" (Clark and Withers, 1999:660). The ratio was higher for single workers and renters and higher the larger the metropolitan area (Ibid: 660-1). Furthermore, "job change served as a significant trigger of residential mobility- after controlling for the other major relocation inducing life cycle changes although their results were only statistically significant for renters (Clark and Withers, 1999:663). These authors also emphasised that while job change can trigger movement more often it occurs alongside other factors which together induce a change in residence.

[29] The ONS analysis of the difference between duration and stated activity category showed that transitions from economic *inactivity* produce the highest percentages of inconsistencies, especially when the transition is into unemployment and that this was especially true for those in part-time employment (ONS, 1997:12).

[30] For a discussion of the merits and demerits of using adjusted and unadjusted (for classification error) data see Jones (1993: 3).

[31] Although not based on gross flows Groenewold's work clearly establishes these interactions (Groenewold 1991, 1995). So too of course does the extensive literature on the sensitivity of migration to local labour market conditions.

[32] Early steps in this direction have already been taken by Armstrong and Taylor for example who place the relationship between labour stocks and flows in a multiregional framework (Armstrong and Taylor, 1986).

[33] We are indebted to John Scott, Statistics New Zealand, for emphasising this point. The reduction is apparent from a comparison of jobless and unemployment transition

rates. In Gisborne for example the Relative Standard error for the male transition in Gisborne from E to J is 53.5 compared to 67.14 for E to U. However the transition UE where the probability is much higher (32.78 and 41.84 respectively) at the same time the difference in errors is marginal, 33.82 vs 33.37.

[34] Berezovsky's own analysis points quite strongly to the underlying demand conditions of the regions in accounting for variations in transitional probabilities (Berezovsky, 2001).

[35] See for example Poterba and Summers, (1993). This would also have the added advantage of allowing us to model the choice among more than two labour states. For example the employed could be modeled as making a choice in the next period of either remaining in employment, actively searching as unemployed, joining the peripheral labour force, or withdrawing without any apparent intention of searching. Similar models could be constructed for those in any other state.

[36] Respondents are asked to identify the *main* reason among the following for not looking for work in the last four weeks: 1. Waiting for season to start or start a definitely arranged job, 2. Own illness or injury, 3. Attending educational institution, 4. No need to work, 5. Ill health of others, 6. Unable to find suitable childcare, 7. Believe lack of skills or wrong age, 8. Believe not enough suitable work available in area, 9. Temporary layoff-without pay-expect to return, 10. Waiting to hear from employers about job, 11. Other, specify. (Statistics New Zealand, Household Labour Force Survey personal questionnaire, question 55 page 5). The potential for further exploration of responses to these questions is considerable.