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Labour Market Flows in New Zealand: Some Questions and Some Answers*

Brian Silverstone
University of Waikato

Email: silver@waikato.ac.nz
Phone: (07) 856-7207

Will Bell
Statistics New Zealand

Email: will.bell@stats.govt.nz
Phone: (04) 931-4779

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Abstract

Statistics on the flow of workers moving between employment, unemployment and non-participation provide some of the most interesting and useful insights into labour market outcomes. Flows data make it possible, for example, to estimate the number and probability of workers moving between labour market states, say from unemployment to employment. Despite research, New Zealand's official gross flows data are relatively neglected and almost entirely unused in published public and private sector economic commentaries, forecasting, modelling activities and policy debates. Using a framework of questions and answers, this paper considers selected aspects of New Zealand's gross labour flows data as well as international comparisons.

Keywords

gross worker flows
labour market dynamics
household labour force survey
New Zealand

JEL Classification

E24; J64

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1. Introduction

Statistics on the flow of workers moving between employment, unemployment and non-participation provide some of the most interesting and useful insights into labour market outcomes. Research using flows data, rather than end-of-period stocks, began in the United States when the availability of matched household panel data made it possible to estimate the number of workers moving between labour market states, for example, from unemployment to employment. (See Marston 1976 and Flaim and Hogue 1985). The availability of household panel data in other countries has now led to an extensive literature on worker and job flows. New Zealand's experience is typical. The publication of the Household Labour Force Survey in 1986, and the initial gross flows paper by Woolf (1989), led to research using flows data. (See, for example, Grimmond 1993, Silverstone and Gorbey 1995, Irvine 1995, Chapple, Harris and Silverstone 1996, Herzog 1996, Wood 1998 and Silverstone 2001). Despite this research, New Zealand's gross flows data are relatively neglected and almost entirely unused in published public and private sector economic commentaries, forecasting, modelling activities and policy debates.

Using a framework of questions and answers, this paper considers selected aspects of New Zealand's gross labour flows data as well as international comparisons. Our overall aim is to encourage wider use of New Zealand's flows data by highlighting the insights that are available from using *flows* data that are not available from the more familiar *stock* data of persons employed, unemployed and not in the labour force. The sections which follow will consider the following questions:

- What proportion of the workforce changes status between quarters?
- What is the probability of a worker changing status between quarters (such as moving from unemployment to employment) and what is the steady-state rate of unemployment?
- To what extent do the workforce proportions and probabilities differ by age, gender and ethnicity?
- What are the cyclical characteristics of worker flows and what is the relative importance of inflows and outflows in explaining changes in employment, unemployment and non-participation?
- Are there any problems using flows data?
- What have we learned from gross flows modelling?
- How useful are flows data in forecasting, policymaking and economic commentaries?

2. What Proportion of the Workforce Changes Status between Quarters?

Each quarter, Statistics New Zealand conducts a Household Labour Force Survey (HLFS) involving some 30,000 people in 15,000 households. Households remain with the survey for eight consecutive quarters. Each quarter, one eighth of households are rotated out of the survey and replaced by a new sample. Between quarters, an individual will experience at

least one of nine possible labour market states. Three situations reflect an unchanged status between quarters, namely, continuing employment (*EE*, implying $E_{t-1} \rightarrow E_t$), unemployment (*UU*) or non-participation (*NN*). Six situations reflect labour market changes between quarters, for example, from employment in the previous quarter (E_{t-1}) to unemployment in the current quarter (U_t) or *EU*. At any given time, though, an individual is either employed (*E*), unemployed (*U*) or not in the labour force (*N*) or non-participation.

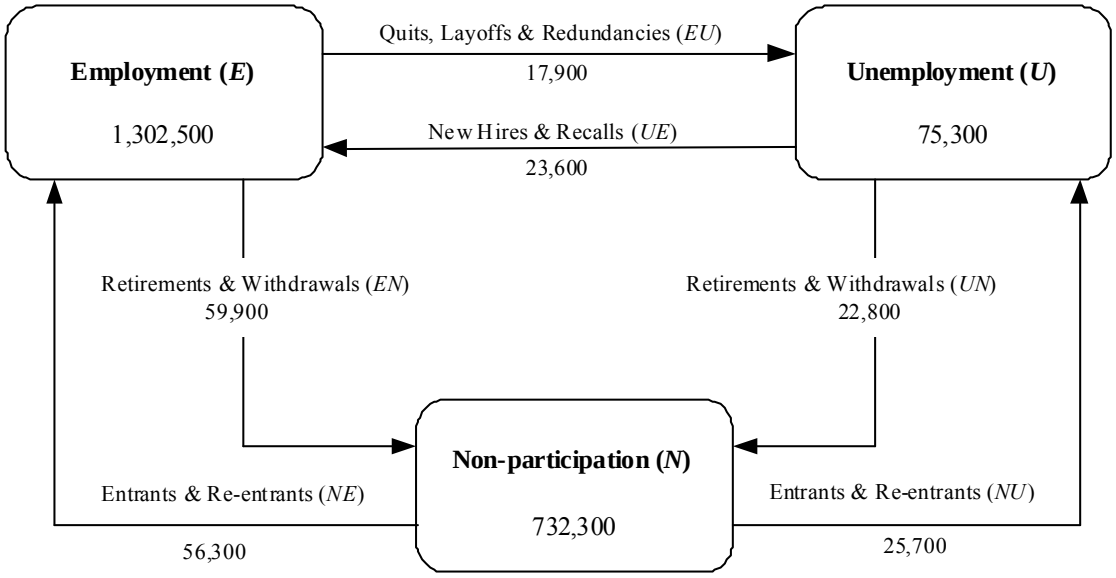
Table 1, which is also illustrated in Figure 1, shows average quarterly gross labour flows from 1986:2 to 2010:1. The column totals in Table 1 are the average current quarter stock totals for matched employment, unemployment and non-participation while the row totals correspond to the previous quarterly average. Due to survey rotation and revision, and factors such as households shifting and deaths, the gross flows (GF) totals for *E, U* and *N* are, on average, 73, 62 and 74 percent, respectively, of the full Household Labour Force Survey (HLFS) and not the 87.5 maximum possible matching between quarters.

Table 1. Gross Labour Market Flows in New Zealand 1986-2010
Quarterly Average, All Persons, All Ages, Thousands

Status in Previous Quarter	Status in Current Quarter			
	E_t	U_t	N_t	Row Totals
E_{t-1}	1224.7 (*EE*)	17.9 (*EU*)	59.9 (*EN*)	1302.5
U_{t-1}	23.6 (*UE*)	28.9 (*UU*)	22.8 (*UN*)	75.3
N_{t-1}	56.3 (*NE*)	25.7 (*NU*)	650.3 (*NN*)	732.3
Column Totals	1304.6	72.5	733.0	2110.1

Source: Statistics New Zealand, Household Labour Force Survey, Gross Flows.

Figure 1. Gross Labour Market Flows in New Zealand 1986-2010
Quarterly Average, All Persons, All Ages, Number



Source: See Table 1.

Several features emerge from the information in Table 1 and Figure 1. First, the quarterly changes in *matched E, U* and *N* are identically equal to the difference between their respective inflows (*I*) and outflows (*O*), that is,

$$\begin{aligned} \Delta E_t &= E_t - E_{t-1} = I_E - O_E = (UE + NE) - (EU + EN) \\ \Delta U_t &= U_t - U_{t-1} = I_U - O_U = (EU + NU) - (UE + UN) \\ \Delta N_t &= N_t - N_{t-1} = I_N - O_N = (EN + UN) - (NE + NU) \end{aligned} \tag{1}$$

Using data from Table 1, the gross flows measure of the net change in unemployment (ΔU) between 1986 and 2010 is an average quarterly decline of 2,800 persons. The calculation for this outcome, using equation (2), is (in thousands):

$$\Delta U = 72.5 - 75.3 = 43.6 - 46.4 = (17.9 + 25.7) - (23.6 + 22.8) = -2.8 \tag{2}$$

The *net* change in unemployment of 2,800 people is the outcome of two 'large' *gross* changes: 43,600 quarterly inflows into unemployment (I_U) and 46,400 outflows (O_U). The quarterly outflow of 46,400 people implies that around 60 percent of the total number of unemployed persons in the previous quarter (75,300) changed their status just one quarter later to either employment (23,600 people) or to non-participation (22,800 people).

Secondly, the total of the off-diagonal elements in Table 1 imply that 10 percent of matched respondents changed their status *every quarter*, on average, between 1986 and 2010. This figure, which excludes job-to-job changes, may be compared with the UK quarterly average of 7 percent between 1996 and 2007 (Gomes 2009 p.6) and 6.4 percent *every month*, on average, in Australia between 1997 and 2010 (see footnote 2) and 7 percent *every month* in the United States between 1990 and 2006 (Boon *et al*. 2008, p.10). In short, labour markets, perhaps surprisingly to outside observers, are highly dynamic.

Thirdly, the flow from non-participation to employment (*NE*) is more than twice the size of the flow from unemployment to employment (*UE*). Similarly, the flow from *N* to *U* is significantly greater than the flow from *E* to *U*. The role of non-participation is therefore important in understanding labour market dynamics.

3. What is the Probability of a Worker Changing Status between Quarters?

Table 2 shows the probabilities (also called flow rates or hazards) of an individual staying or moving between states. Formally, they are first-order Markov transitions whereby the probability of an individual staying or moving between states depends only on the individual's immediately preceding state. The probabilities are calculated by dividing each cell in Table 1 by its row total, for example:

$$ue = \left(\frac{UE}{U_{t-1}}\right) = \left(\frac{UE}{UE + UU + UN}\right) = \left(\frac{23.6}{75.3}\right) = 0.313 \text{ or } \approx 31\% \tag{3}$$

Table 2. Gross Labour Market Transitions in New Zealand 1986-2010
Quarterly Average, All Persons, All Ages, Ratio

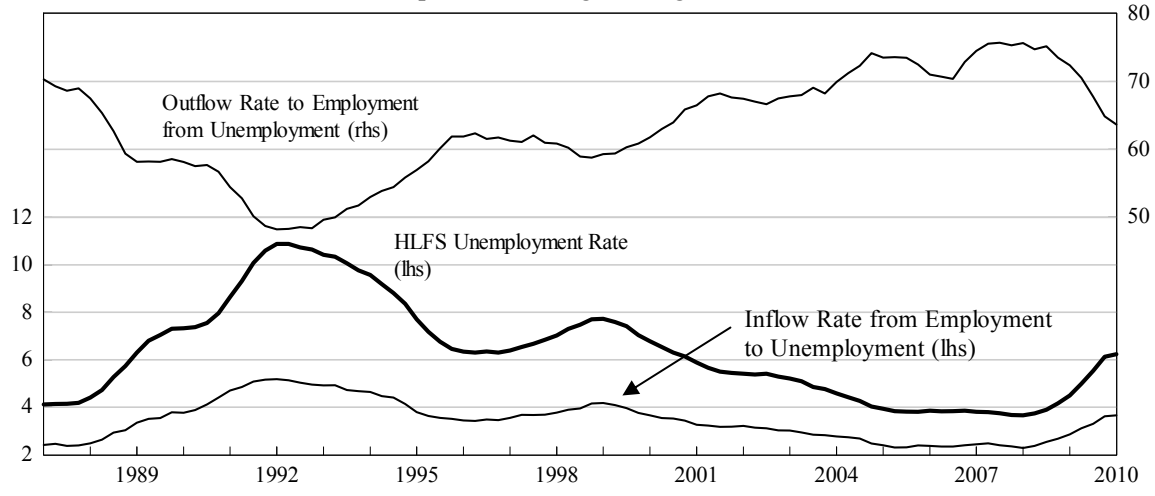
Status in Previous Quarter	Status in Current Quarter			
	E_t	U_t	N_t	Total
E_{t-1}	0.94 (*ee*)	0.01 (*eu*)	0.05 (*en*)	1
U_{t-1}	0.31 (*ue*)	0.38 (*uu*)	0.30 (*un*)	1
N_{t-1}	0.08 (*ne*)	0.04 (*nu*)	0.89 (*nn*)	1

Note: Entries have been rounded.
Source: See Table 1.

In equation (3), 23,600 matched respondents, or 31 percent of total unemployment in period t-1, reported that they had moved from unemployment in the previous quarter to employment in the current quarter (or *UE*). In a first-order Markov setting, this outcome implies that there is a probability of 0.31 that a person who is unemployed in period t-1 will be employed in period t. Similarly, as Table 2 shows, 38 percent of the unemployed between 1986 and 2010 could, on average, expect to remain unemployed between quarters and 30 percent to move to non-participation. Expressed alternatively, for every 100 people who were unemployed in the previous quarter, 31 could, on average, expect to be in employment in the current quarter, 38 to remain unemployed and 30 to move to non-participation. Similar reasoning applies to the employment and non-participation. Since the rows sum to unity in Table 2, only six of the nine transition probabilities are independent.

Figure 2 plots the HLFS unemployment rate against the inflow and outflow rates to and from unemployment. The inflow rate is $(EU+NU)/E_{t-1}$, using employment as the base, and the outflow rate is $(UE+UN)/U_{-1}$, using unemployment as the base. Figure 2 shows that the unemployment rate between 1987 and 2010 was the outcome of different inflow and outflow combinations. The stable unemployment rate between 2005 and 2007, for example, was associated with stable inflow and outflow rates, whereas the increased rate between 2008 and 2010 was associated with unfavourable movements in both the inflow and outflow rates.

Figure 2. Inflow, Outflow and Unemployment Rates 1987-2010
Four-quarter Moving Averages, Percent



Source: Statistics New Zealand.

Figure 3, based on Elsby *et al.* (2009a, p.37), shows quarterly average inflow rates to unemployment from employment (*eu*) and outflow rates from unemployment to employment (*ue*) in 14 OECD economies. The vertical and horizontal lines are the raw means. They separate and highlight the significant variation in flow rates between North American, Nordic and Pacific economies and continental Europe. The contrast between Europe and the United States is especially stark. There are two distinct groupings. In the group of countries in the lower quadrant, such as France, Germany and Italy, there is a lower probability of people entering unemployment *and* a lower probability of leaving unemployment compared to the group of countries in the upper quadrant, such as Australia, New Zealand and Canada.

Figure 3. Average Quarterly Inflow and Outflow Rates to and from Unemployment
Selected OECD Countries, Variable Starting Dates to 2007, Percent

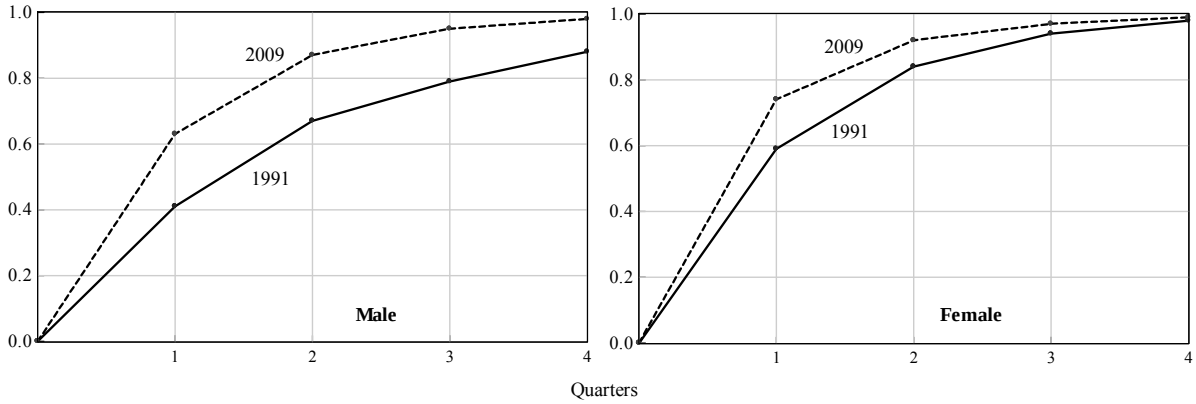
Source: Elsby *et al.* (2009a, Table 2, p.37).

These outcomes do not appear to be explained mainly by different growth rates or growth rate variability. This leaves institutional and related explanations. Among the possibilities is employment protection legislation (EPL). The countries in the upper quadrant have (with some exceptions, such as Norway), less strict EPL than countries in the lower quadrant (with some exceptions, such as the UK and Ireland). In addition, the upper quadrant countries have a significantly lower proportion of people unemployed 12 months or longer compared to the countries in the lower quadrant (OECD, 2010). Blanchard and Portugal (2001) argue similarly, that high employment protection is a plausible explanation for Portugal's lower labour market flows compared to the United States.

For a further perspective, and following Kuroda (2003, p.85 and fn.19), Figure 4 shows, for New Zealand, the cumulative probability of men and women leaving unemployment (either to employment or to non-participation) over the four consecutive quarters of 1991 and 2009. It shows, for example, that in 2009, there was approximately a 90 percent probability of both men and women leaving unemployment after two quarters compared to the 1991 outcome of approximately 70 percent for men and 85 percent for women.

Figure 4. Exit Probability from Unemployment in New Zealand in 1991 and 2009

Men and Women, All Ages



Source: Statistics New Zealand, Kuroda (2003) and authors' calculations.

The transitions in Table 2 can also be used to give insights into the 'steady-state' rate of unemployment and the duration and frequency of unemployment. If, for example, the flows to and from unemployment are equal, then the resulting 'steady-state' rate of unemployment (u^*) can be expressed in terms of the off-diagonal transitions in Table 2. This expression, adapted from Petrongolo and Pissarides (2008, p.258), is shown as equation (4).

$$u^* = \frac{eu + \dfrac{nu.en}{nu + ne}}{eu + \dfrac{nu.en}{nu + ne} + ue + \dfrac{un.ne}{nu + ne}} \tag{4}$$

Although this so-called 'steady state' rate of unemployment usually differs from the actual unemployment rate, due mainly to data bias, equation (4) 'indicates where the labour market is headed if the current transition probabilities were to remain constant' (Keeley 1984, p.11). It implies - through the six off-diagonal transition rates - that there are potentially many influences on the rate of unemployment.

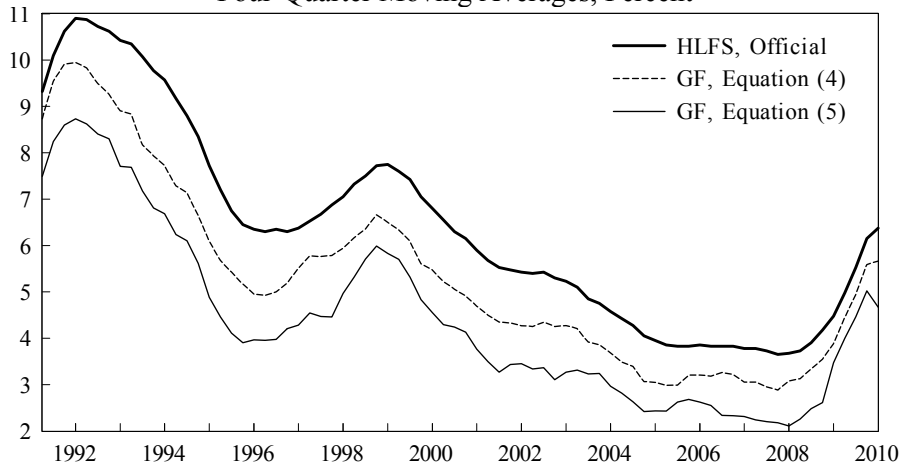
If the transitions involving flows to and from non-participation (that is, *en, un, ne* and *nu*) are ignored, equation (4) becomes:

$$u^* = \frac{eu}{eu + ue} = \frac{\text{separation rate}}{\text{separation rate} + \text{finding rate}} \tag{5}$$

This equation appears frequently in flows analysis. (See, for example, Elsby *et al.* 2009a, Fujita 2007 and Shimer 2005). The correlation coefficients between the New Zealand unemployment rates generated from equations (4) and (5) and the HLFS unemployment rate are 0.97 and 0.94, respectively. As Figure 5 shows, however, both definitions underestimate the actual HLFS unemployment rate, with equation (5) - which omits transitions to non-participation - the poorer performer. This is further evidence that it may be inappropriate to ignore flows to and from non-participation when studying labour market behaviour.

Figure 5. Unemployment Rates by Different Definitions 1991-2010

Four-Quarter Moving Averages, Percent



Source: Statistics New Zealand and authors' calculations.

4. What are the Disaggregated Proportions and Probabilities?

The discussion so far has considered aggregate outcomes only with no disaggregation by microeconomic characteristics such as gender, age, ethnicity, qualifications or regions. Table 3 shows transition rates by gender, age and ethnicity. Several features may be noted. First, the transition from unemployment to employment (*ue*) - the probability of obtaining employment - is very similar across all groups at a quarterly average of around 30 percent. Secondly, males are more likely to stay in unemployment (*uu*) compared to females (44 percent versus 31 percent, respectively, on average). Thirdly, males and females differ relatively little in the transition from non-participation to employment (*ne*). Fourthly, Maori transitions are mostly unfavourable relative to the overall labour force. Finally, teenagers, have the highest transition rates from employment to unemployment and non-participation (the *eu* and *en* flows).

Table 3. Labour Market Flow Rates 1986-2010

Quarterly Averages, Percent, Persons and Ethnicity

	All Persons and Ages	All Males	All Females	Teenagers (15-19 yrs)	Youth (20-24 yrs)	Maori (All Ages)
eu	1.4	1.5	1.3	3.6	2.5	2.9
en	4.6	3.1	6.4	13.5	5.2	6.1
ue	31.4	30.5	32.5	31.4	33.1	24.5
uu	38.3	44.3	31.1	32.1	40.3	42.3
un	30.2	25.2	36.4	36.5	26.6	33.1
ne	7.7	8.0	7.5	16.9	19.9	8.8
nu	3.5	4.4	3.0	8.5	9.0	7.8

Source: Statistics New Zealand, Household Labour Force Survey.

In an Australian gross flows study, Chan and Mangan (2004) found some surprising results among three age groups: teenager (15-19 years), youth (20-24 years) and adult (25 years and above). They found that the *teenage* and *adult* markets are not distinct. Rather, they are strongly interlinked and Granger-cause each another. This link is inverse, apparently, with flows into unemployment for teenagers associated with flows into employment for

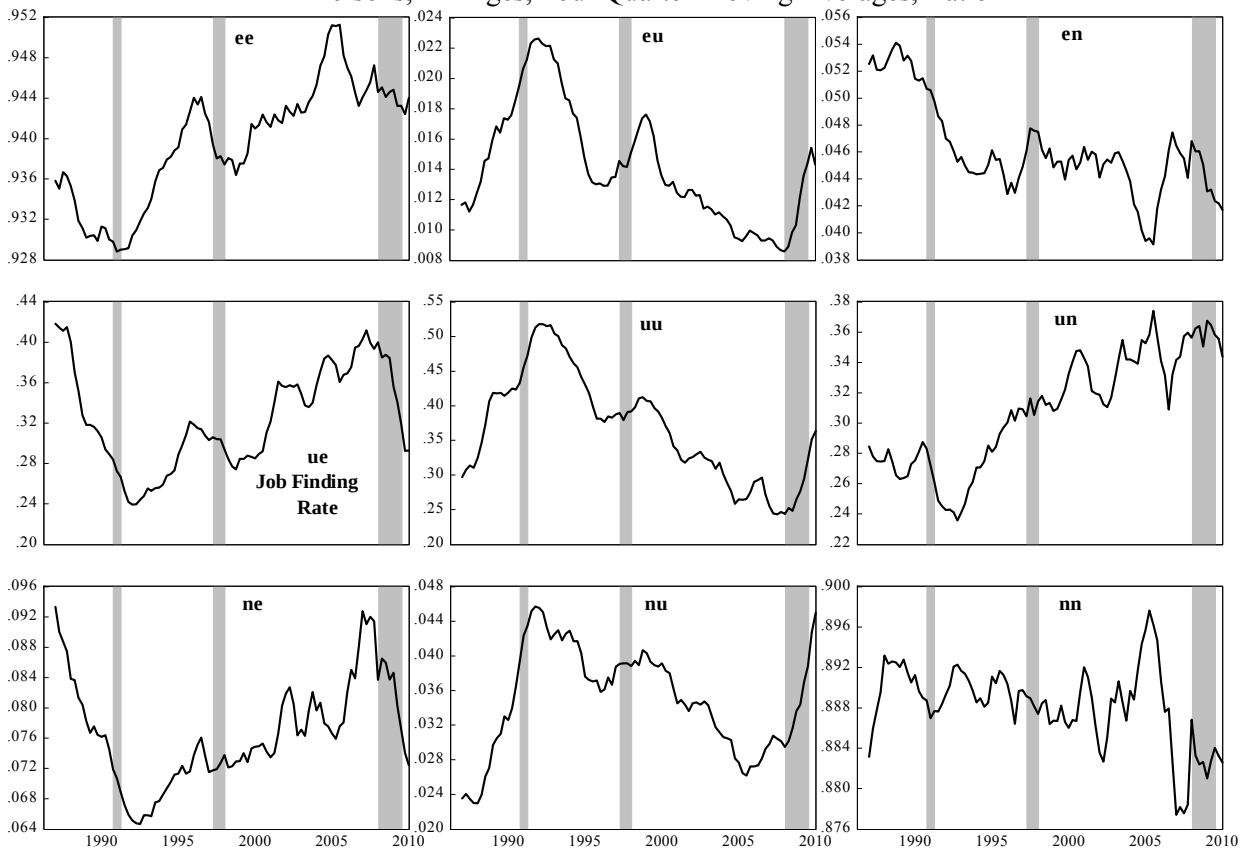
adults. This result, say Chan and Mangan, implies caution when attempting to devise 'youth only' policies. They also found that the *youth* labour market is almost independent of the *adult* labour market. There is also evidence of Granger-causality in New Zealand data (with a two-quarter lag). Specifically, our initial work appears to show that teenagers losing jobs (*EU*) leads adult job finding (*UE*) and adults losing jobs (*UE*) leads teenagers job finding (*UE*). There is no evidence that teenagers finding jobs (*UE*) leads to adults losing jobs.

5. What are the Cyclical Characteristics of Worker Flows?

Figure 6 shows time series for all nine transition probabilities in Table 2. The shaded areas are peak-to-trough cycles identified by Hall and McDermott (2009, p.1055) and by the authors (for the 2008-2009 period). Several features emerge. First, most of the series (apart from *nn*) appear to be either pro-cyclical (*ue, ne*) or counter-cyclical (*eu, ne*) and to display persistence. Secondly, the all-important job finding rate (*ue*) - the probability of a worker moving from unemployment to employment between quarters - has ranged from over 40 percent to under 25 percent with a mean of around 33 percent. Thirdly, at the trough of the recession that ended around 1991-92, the quarter-by-quarter 'retention rate' into continuing unemployment (*uu*) was 50 percent. This rate fell to around 25 percent at the peak of the boom that ended around 2008. Fourthly, since 1992, there has been a generally upward trend in the probability of an individual moving from unemployment to non-participation (*un*).

Figure 6. Gross Flow Transition Rates in New Zealand 1986-2009

All Persons, All Ages, Four Quarter Moving Averages, Ratio



Sources: Statistics New Zealand, Household Labour Force Survey, Hall and McDermott (2009) and authors.

Table 4 summarises New Zealand's gross flow experiences over three cyclical periods between 1990 and 2008 as determined by Hall and McDermott (2009). Several features emerge. First, in every cycle over the period, the average quarterly matched flow from unemployment to employment (*UE*) was *greater* than the flow from employment to unemployment (*EU*). In other words, in both stagnation and expansion, more people within the labour force flowed into work than away from work. This surprising outcome - explained partly by the increase in the unemployment base during recessions - implies that the unemployment rate can be influenced significantly by labour force entry and exits, that is, by movements to and from non-participation. This observation is confirmed in Table 4 where the *EN* flow dominates the *NE* flow and *NU* dominates *UN*.

Table 4. Gross Flow Levels and Rates over Cyclical Periods in New Zealand 1990-2008
Quarterly Averages over each Period, All Ages, Males and Females

	Peak-to-Peak		Peak-to-Trough (Stagnation Periods)		Trough-to-Peak (Expansion Periods)	
	1990:4 1997:2	1997:2 2008:1	1990:4 1991:2	1997:2 1998:1	1991:2 1997:2	1998:1 2008:1
Unemployment Rate (%)	8.0	6.8	10.6	7.7	6.8	4.1
			Gross Flow Levels (000s)			
UE	26.8	22.8	26.2	24.6	23.5	27.1
EU	20.5	16.2	25.2	19.3	20.1	20.1
UN	26.4	22.4	25.1	26.3	21.2	26.6
NU	29.7	25.0	32.3	29.0	24.7	29.4
NE	50.8	59.6	50.1	55.1	53.7	50.7
EN	53.7	62.1	55.7	60.7	58.9	53.5
UU	45.0	22.1	48.8	32.8	33.1	45.0
			Gross Flow Rates (Transitions)			
ue	0.27	0.34	0.26	0.29	0.30	0.27
eu	0.02	0.01	0.02	0.02	0.02	0.02
un	0.27	0.33	0.25	0.31	0.27	0.27
nu	0.04	0.03	0.04	0.04	0.04	0.04
ne	0.07	0.08	0.07	0.07	0.08	0.07
en	0.05	0.04	0.05	0.05	0.05	0.05
uu	0.46	0.33	0.49	0.39	0.43	0.46

Sources: Statistics New Zealand, OECD *Main Economic Indicators* (GDP), Hall and McDermott (2009).

A second feature of Table 4 also relates to non-participation. While the quarterly $N \leftrightarrow E$ flows (*NE* and *EN*) are not too dissimilar in aggregate across different cyclical periods, the $N \leftrightarrow U$ flows (*NU* and *UN*) are somewhat different when aggregated. The increase in *NU*, as the economy improves, may reflect the improved prospects for employment (via unemployment, in the first instance) from previous non-participants. Similarly, the *increase* in *UN* during expansions may be the result of discouragement among previously unemployed workers, retirements and the improved opportunity for further education. These features of Table 4 highlight still further the importance of non-participation in understanding labour market behaviour and economic performance. (See Jones and Riddell 1999). Thirdly, there is cyclical information from the transition rates. First, apart from unemployment, the probability of continuing employment and non-participation show relatively little cyclical fluctuation although their bases are large.

There are further insights if we separate the transitions into their trend and cyclical components. Equation 6 is a basic specification where p_{ij} is the transition probability of moving from state i to state j, t is time (taking the value 1 in 1986:1), c is a measure of cyclical influence (tested using GDP growth, GDP gap, the unemployment rate and capacity utilisation), s represents seasonal dummies and ε is a random error term.

$$\ln p_{ij} = \alpha_0 + \alpha_1 t_t + \alpha_2 \ln c_t + \alpha_3 s_{it} + \varepsilon_t \quad i, j = 1,2,3 \tag{6}$$

Table 5 shows OLS regression results for trend and cyclical influences on New Zealand's transition rates by gender from 1986:1 to 2001:1. The unemployment rate was found to be the most satisfactory cyclical indicator. Chow tests for a structural break around 1991-1992 (a cyclical trough and the introduction of the Employment Contracts Act 1991) is accepted clearly only for the male employment to unemployment transition (*eu*) and marginally for the female employment to not in the labour force transition (*en*). This finding tends to supports Herzog's (1996) view regarding the impact of the Employment Contracts Act 1991.

Table 5. Trend and Cyclical Influences on New Zealand Transition Rates
By Gender, All Ages, Quarterly, 1986:1-2001:1

	Dependent Variable	Constant	Trend	Cycle	DW	$\overline{R}^2$ (adj)
(a)	*Employment to Unemployment* (*eu*)					
	Males	-1.006	-0.0035	0.822	1.60	0.75
		(8.5)	(3.62)	(13.37)		
	Females	-0.904	-0.0058	0.672	1.69	0.75
		(7.7)	(5.92)	(10.97)		
	Unemployment to Employment (*ue*)					
	Males	4.592	-0.0015	-0.573	1.68	0.83
		(63.8)	(2.56)	(15.28)		
	Females	4.321	-0.0016	-0.442	1.69	0.77
		(60.1)	(2.71)	(11.8)		
(b)	*Employment to Not in Labour Force* (*en*)					
	Males	1.231	-0.0014	-0.084*	1.63	0.40
		(15.6)	(2.19)	(2.04)		
	Females	2.185	-0.0043	-0.081	1.64	0.73
		(41.1)	(9.73)	(2.93)		
	Not in Labour Force to Employment (*ne*)					
	Males	2.785	-0.0019	-0.322	1.90	0.77
		(39.7)	(3.22)	(8.81)		
	Females	2.45	-0.0005	-0.215	1.93	0.59
		(44.8)	(1.02)	(7.56)		
(c)	*Unemployment to Not in Labour Force* (*un*)					
	Males	3.572	0.0081	-0.400	1.79	0.72
		(39.2)	(10.74)	(8.43)		
	Females	3.646	0.002	-0.071	1.98	0.32
		(47.7)	(3.18)	(1.79)		
	Not in Labour Force to Unemployment (*nu*)					
	Males	0.250	0.0049	0.612	1.80	0.77
		(2.52)	(5.27)	(10.57)		
	Females	-0.206*	0.0045	0.622	1.54	0.79
		(2.07)	(5.46)	(12.1)		

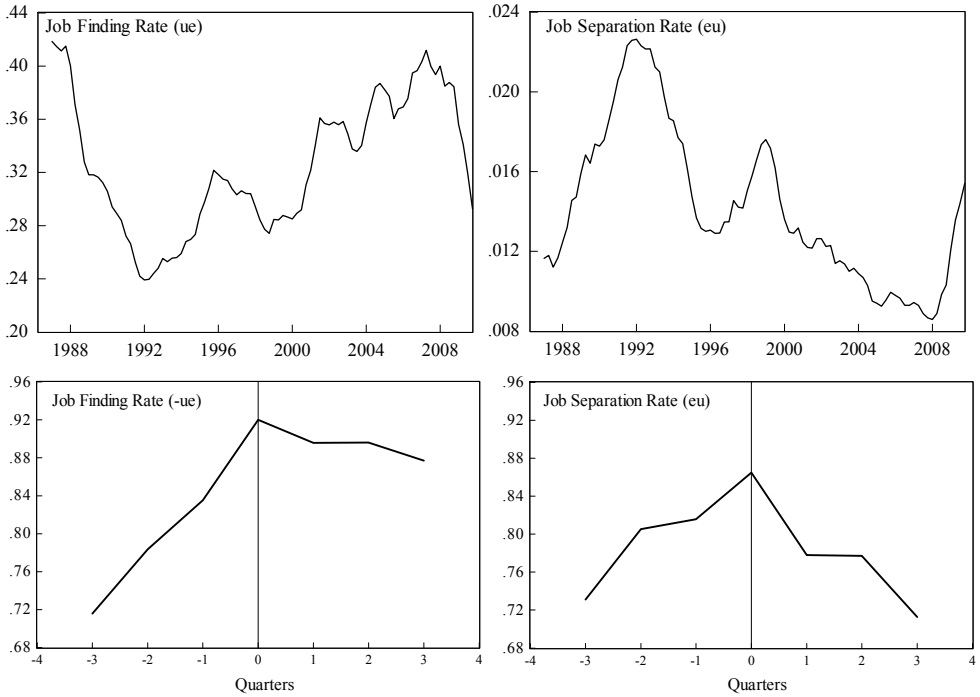
Note: Seasonals not shown. *t*-statistics in parenthesis. * significant at 5 percent.
Source: Statistics New Zealand.

To keep the interpretation of Table 5 manageable and relatively brief, consider the following pairings: employment to unemployment transitions ($e \leftrightarrow u$), employment to not in the labour force ($e \leftrightarrow n$) and unemployment to not in the labour force ($u \leftrightarrow n$). The $e \leftrightarrow u$ transitions are almost identical for male and female *eu* trends while the cyclical influences are asymmetrical: those from *e* to *u* are stronger than those from *u* to *e*. Male cyclical responsiveness, however, is higher than female: an increase in the rate of unemployment - our cyclical indicator - leads to a more responsive movement of males into unemployment and females out of unemployment, and conversely.

With respect to $e \leftrightarrow n$ transitions, the *en* cyclical responsiveness of males and females is relatively weak while the male and female cyclical *ne* flows are significant. Re-specification of the *en* equation may disclose missing (micro) influences such as retirement and further education. With respect to $u \leftrightarrow n$ transitions, the *nu* male and female trend and cyclical are very similar: an increase in the rate of unemployment results in a very similar increase in the male and females transition from not in the labour force to unemployment (*nu*).

Finally, one of the current themes in the gross flows literature is the extent to which the cyclical behaviour of unemployment is driven by hires and/or by separations. The conventional wisdom, as Gomes (2009 pp.24-25) observes, is that recession unemployment is driven mainly by a high separation rate (*eu*). An alternative view is that cyclical unemployment is driven largely by the job-finding rate (*ue*) with the separation rate close to being acyclical. Figure 7 shows New Zealand's finding and separation rates and their cross-correlations with the unemployment rate. The separation and finding rates both appear to be cyclical with cross-correlations that peak contemporaneously with the unemployment rate.

Figure 7. Job Finding (-*eu*) and Job Separation Rates (*eu*)
Cross Correlations with the Unemployment Rate ($t+i$) at Quarterly Leads and Lags



Source: Statistics New Zealand.

6. Are there any Problems using Flows Data?

Labour market gross flows data are vulnerable to bias from several sources. These include rotation group bias, classification error, time aggregation bias and the effect of excluding job-to-job movements. These effects can cause over and under-statement of labour flows, resulting possibly in misleading statistics and consequently the hesitation by some statistical agencies in making flows data either more easily available or including them in official labour market announcements.

Rotation group bias, also called non-response bias, occurs when the characteristics of the matched sample (regarding, say, age, gender, marital status and region) differ from the full sample. Given that one-eighth of the households in the New Zealand HLFS are rotated out of each survey, gross flows data can match a maximum 87.5 percent of surveyed households between quarters. In practice, the level of matching has been around 75 percent for those who are employed and around 60-65 percent for those who are unemployed. This attrition occurs because some people refuse to reply while others cannot be contacted between quarters, especially the young, those living in large urban areas and renters.

Woolf (1989, pp.34-35) found that rotation group errors have had little effect on the New Zealand match between the gross flows estimates of employment and the full sample survey estimates. Overall, and subject to some qualifications, she found that it was reasonable to assume that the characteristics of persons in the unmatched sample were the same as those in the matched sample. Using a longer series, we also found the age composition of the matched sample versus the full sample between 1985 and 2009 to be very similar. On average, people up to 49 years of age were slightly over-represented in the matched sample, whereas those aged 50 and above were slightly under-represented. Maori appear to be slightly over-represented in the matched sample. Elsewhere, the UK Office for National Statistics has a weighting method to minimise rotation group bias. (See Jenkins and Chandler 2010, p.26).

Rotation group bias also includes mode-of-interviewing effects where people may respond differently in face-to-face, telephone, self-reporting and proxy situations. People who report that they are unemployed in their first interview (which is face-to-face) may, for example, report untruthfully in their second interview (which is usually by telephone) that they are employed (Flaim and Hogue 1985). One American study using the US Current Population Survey found that households in their first interview reported 10 percent higher unemployment than the sample as a whole (Bailar 1975).

New Zealand's Household Survey includes both face-to-face and telephone interviewing. We found that the new entrant rotation group reports about six percent more unemployment than the sample average. As the first interview is conducted face-to-face, this outcome supports the view that people may respond differently to different interviewing situations. In equation (7), ru is the proportion of people in each interview mode who are unemployed, f is a dummy variable for face-to-face interviewing ($f = 1$ if face-to-face, 0 otherwise), u is the

seasonally adjusted unemployment rate as a proxy for the business cycle and ε is a random error term. We expect the coefficients on both face-to-face interviewing and the business cycle to be positive.

$$ru_t = \alpha_0 + \alpha_1 f_t + \alpha_2 u_t + \varepsilon_t \quad (7)$$

Table 6 reports results from our initial specification using quarterly data from 1997 to 2009. Regression (a) implies that face-to-face interviewing results in a two percent increase in reported unemployment, when controlling for the business cycle. Changes in HLFS collection, such as the introduction of a centralised call centre and computer assisted telephone interviewing (CATI), appear to have reduced the bias associated with face-to-face interviewing. These changes were fully implemented by March 2006. Regression (b) shows that the face-to-face interview coefficients differ in the periods on either side of the mode change. This conclusion is supported by Chow tests indicating a structural break in the series around 2006.

Table 6. Influences on Reported Unemployment in the HLFS
OLS, Dependent Variable: Reported Unemployment Rate (*ru*)

Period	Constant	Face-to-Face Interview (*f*)	Business Cycle (*u*)	R^2 (adjusted)
(a) 1997:1 - 2005:4	-0.016	0.029	0.008	0.90
	(-4.7)	(19.9)	(14.8)	
(b) 2006:1 - 2009:4	-0.003	0.010	0.007	0.91
	(-1.5)	(9.6)	(14.6)	
(c) 1997:1 - 2009:4	-0.014	0.023	0.008	0.84
	(-5.0)	(16.6)	(16.4)	

Note: t-statistics are in parentheses. This analysis considers face-to-face interviewing only and not all modes in the HLFS.
Source: Statistics New Zealand and authors' calculations.

Classification error is potentially the most serious gross flows data problem. It occurs when there is incorrect data entry and faulty, or deliberately false, recall by panellists regarding their labour market status. Classification error leads to spurious gross flows and transition rates. If, for example, a person is initially classified correctly in period *t* as employed, incorrectly in period *t*+1 as unemployed and correctly in period *t*+2 as employed, two spurious flows or transitions have been recorded: $E \rightarrow U \rightarrow E$ rather than the 'no transition' record of $E \rightarrow E \rightarrow E$. There is evidence that classification error results in an overstatement of some of the movements between labour market states. The best-known study is by Abowd and Zellner (1985). Using United States re-interview data, they found that the flows between *E* and *U* were largely unaffected by classification error, while the flows to and from *N* needed to be reduced substantially.

Bell and Smith (2002, pp.21-22) have suggested an alternative procedure to re-interviewing. It involves examining the number of 'inconsistent' transitions. In the UK quarterly labour force survey, individuals are asked how long they have been employed. If the duration contradicts the transition (if, for example, an individual had been in employment for more than three months, but reported a transition from unemployment to employment)

then the transition is 'inconsistent'. Bell and Smith found a high incidence of inconsistent data. Eight percent of respondents, for example, claimed to have moved from unemployment to employment in the quarter when they were actually employed for more than three months.

Question 59 in the New Zealand Household Labour Force Survey asks 'How long (in weeks) have you been looking for work?' Similarly, Question 64 asks 'How long is it since you did any work for pay or profit in a job, business or farm?' The information from these questions, which are asked only of those who are not employed in the current quarter, enable us to test for inconsistent flows. We define an inconsistent flow as one where the responses to Questions 59 or 64 were given as 'greater than one quarter (13 weeks)' and where labour force status in the previous quarter was given as 'employed'. If a person was looking for a job last quarter, or has not worked since before last quarter's reference period, then they were not employed last quarter. This implies that a matched response reporting an *EN* or *EU* transition for such a person would be inconsistent: such a person would be classified incorrectly as employed last quarter. Conversely, a consistent flow is defined as one where the response to Question 59 or 64 is '13 weeks or less'.

Table 7 shows, from our initial work, that some 12 to 15 percent of *EU* flows are possibly inconsistent and similarly for the *EN* flow (when using the responses to Question 64). These outcomes are comparable to the UK finding on inconsistent flows. We suspect that proxy respondents (one person replying for all persons in a household) are the main source of inconsistent responses.

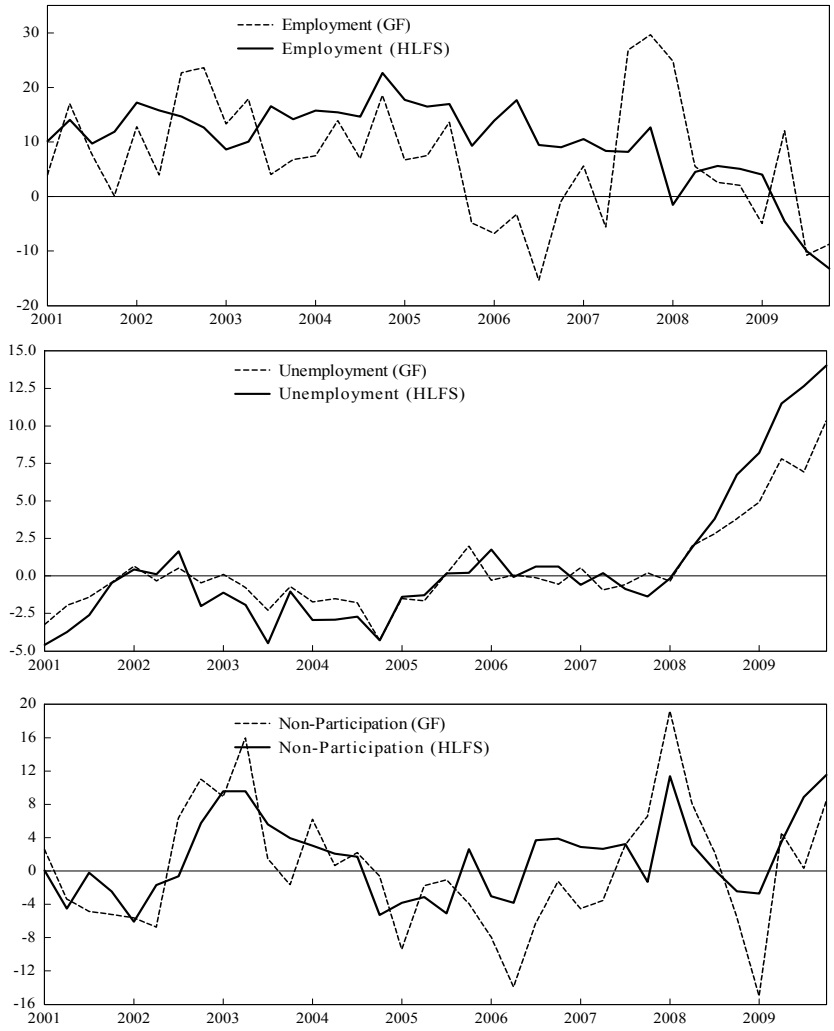
Table 7. Inconsistent Flows in the UK and New Zealand Labour Markets
Percent of Consistent Flows, Period Averages

	UK Summer/Autumn 2000	NZ 2003-2009 Question 59	NZ 2003-2009 Question 64
EU Flow	17.4	15.4	11.9
EN Flow	-	0.7	12.3

Sources: Bell and Smith (2002, p.21), Statistics New Zealand HLFS and authors' calculations.

Figure 8 compares the cumulative changes in actual HLFS employment, unemployment and non-participation with the *net* change in their gross flows counterparts. Despite impressive partial correlations (0.92, 0.82 and 0.92, respectively), there is a tendency for changes in the gross flows (GF) outcomes to understate changes in the official HLFS outcomes especially employment and, more recently, unemployment. This situation is due not only to rotation group bias and classification error but also to changes, from time-to-time, in the size of the gross flows sample. The apparent understatement of the *net* changes in the gross flows (that is, inflows *minus* outflows) does not necessarily mean that the *gross* flows are, separately, too low and should be scaled to match the HLFS outcomes.

Figure 8. HLFS and Gross Flow Changes in the Labour Market 2001-2009
Four Quarter Moving Averages, Persons, Thousands



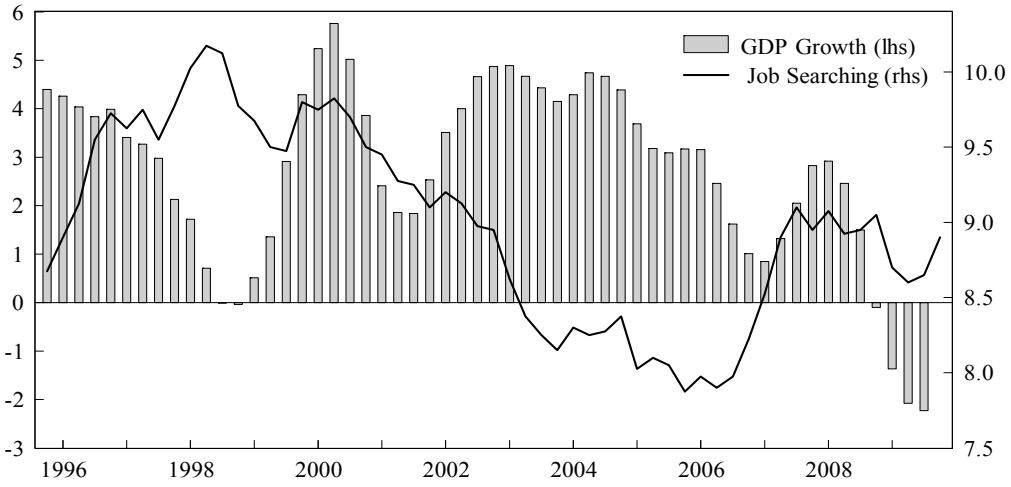
Source: Statistics New Zealand.

Time aggregation bias, an issue raised by Shimer (2007), and the source of some controversy, is an asymmetry bias affecting the correlation between the job-finding and job-separation rates. Specifically, in expansions (compared to contractions), short-period *E-U-E* job separations might not be recorded between surveys, especially monthly surveys. These unrecorded separations bias the correlation between the separation and finding rates negatively. Shimer proposes a method for correcting this apparent bias.

Job-to-job flows, that is, direct employer-to-employer transitions while still employed (or transitions with only a very brief period of unemployment), are typically omitted from gross flows reporting. These flows can be significant. In the UK, job-to-job flows are estimated to be around two percent of the working age population each quarter (Gomes 2009, p.15). In the United States, job-to-job flows are estimated to be 2.6 percent of the employed population *each month*. These flows are as large as the *EN* flows and twice as large as the *EU* flows. 'Clearly, excluding *EE* transitions from an analysis of gross labour market flows misses a large part of the mobility of the U.S. labour market' (Fallick and Fleischman 2004, pp.11-12).

The New Zealand Household Labour Force Survey does not include a direct question on actual job-to-job changes. It does, however, ask the question (Question 26): 'At any time in the last four weeks have you been looking for another job?' Figure 9 shows the percentage of the employed in the full household survey reporting that they were looking for another job. In each quarter, between 8 and 10 percent of all persons employed claim to be job-searching. This searching is cyclical and appears to lead GDP growth with the highest correlation (0.51) at around 10 quarters ahead.

Figure 9. Employed Persons Looking for another Job 1995-2009
Four Quarter Moving Average, Percent of Total HLFS Employment



Source: Statistics New Zealand.

7. What have We Learned from Gross Flows Modelling?

Labour flows data does not, in itself, explain labour market behaviour. This task requires the specification and estimation of micro and macroeconomic relationships. We consider briefly both approaches beginning with the substantially micro-econometric examples of Bellmann *et al.* (1995) and Theeuwes *et al.* (1990). In the Bellmann study on the East German labour market, multinomial logit equations were estimated for the employment and unemployment transitions of men and women. Independent variables included age, marital status, educational attainment, region, industry, full or part-time employment and establishment size. Theeuwes *et al.* (1990) have a similar specification: transitions, not unexpectedly, are a function of age, education, family situation, work experience, health, country of origin and degree of urbanisation.

New Zealand gross flow studies with a substantial microeconomic component include Grimmond (1993), Herzog (1996) and Irvine (1995). Grimmond analysed a range of labour market characteristics including gender, age, ethnic origin, qualifications, location and industry. He found that labour market outcomes for men were considerably poorer than for women, qualifications appear to assist job retention and employability and Maori and Pacific Islanders have a higher likelihood of becoming and remaining unemployed. Irvine also examined characteristics that might determine the probability of moving into employment

(such as the occupation being sought, educational attainment and job search method) and how the effect of these characteristics has changed over time. Irvine found that part-time job seekers had a similar chance of finding work as full-time job seekers. Most significantly, and interestingly, he found (for the period 1990-94) that a person with both school and post-school qualifications was almost twice as likely to obtain employment in the following quarter compared to a person with no qualifications.

Herzog (1996) assumes that transitions are generated by a two-stage process: employment separation (voluntary or involuntary) and the choice between unemployment and non-participation. The main influences on this process include worker characteristics (gender, age, ethnicity, qualifications and marital status), employment status (wage or salary worker, full or part-time worker or looking for another job), industry growth, seasonality and trend effects. Herzog's micro-econometric study confirms earlier work on transitions. One particularly interesting, and perhaps controversial, finding relates to the impact of the Employment Contracts Act 1991. Herzog (1996, p.32) states that 'no evidence is provided to support the contention that layoffs, dismissals and redundancies increased following the implementation of the Act'.

Antolin (1999), DeBoer and Seeborg (1989), Denton (1973), Harris (1996), Holmlund and Vejsiu (2001), Hughes (1992), Keeley (1984), Leeves (1997) and Williams (1995) are all examples of a macro-econometric approach to the study of labour market flows. Apart from Denton, Harris and Hughes, they all use substantially the same core specification to consider the influence of variables ranging from gender and demographic influences to the impact of changes in unemployment benefits, the replacement ratio, labour force participation, output and structural change. In each case, OLS or GLS is used to regress transition rates on seasonals, a time trend and a cyclical indicator (such as GDP growth, the unemployment rate, capacity utilisation and vacancies). Variations to the core specification include lagged dependent variables and variables to control for the Vietnam War and labour legislation changes. Denton (1973) uses multinomial logit modelling while Harris (1996) and Hughes (1992) use cointegration analysis. In Harris's model, unemployment inflow and outflow rates influence each other: firing and hiring is contemporaneous.

Among the country-specific findings, the discouraged worker effect is not supported (Keeley1984), the vacancy-labour force relationship may contribute to the non-linearity of the Phillips curve (Smith 1974), the propensity of women to leave full-time employment has decreased (Williams 1995), a greater variety of contractual arrangements had a favourable impact on employment (Antolin 1999), unemployment dynamics in Australia match North American experience much more closely than European experience (Hughes 1992) and the greater cyclical sensitivity of male-dominated industries than female-dominated industries explains the historic narrowing of the female-male differential in recessions (DeBoer and Seeborg 1989).

New Zealand gross flow studies with a substantial macroeconomic component include Grimmond (1993), Chapple, Harris and Silverstone (1996), Herzog (1996) and Wood (1998). Grimmond (1993) considered trend and cyclical issues and including experiments with GDP, business confidence and capacity utilisation as cyclical measures. Despite the shortcomings of working with just 21 quarterly observations (1986-1991), he found cycles and lags in three transition rates (*eu, uu* and *nu*) and trends in six rates (*ee, eu, ue, uu, ne* and *nu*). Grimmond was unable to test for seasonality.

Chapple *et al*. (1996) specify separate equations for inflows and outflows to and from unemployment for the period 1985-94. They found - somewhat against prevailing opinion - that the NZIER sales constraint series and unemployment duration were the dominant determinants of inflows and outflows to unemployment rather than structural change. Herzog (1996) reached a different conclusion. After controlling for micro-economic influences and cyclical and seasonal factors, his econometric work showed that New Zealand's unemployment experience (1985-1994) was indicative of structural change. Finally, Wood builds a matching function model. He found that flows from unemployment to employment were influenced by those already in employment (job-to-job flows or churning), by non-participants looking for jobs and by the long-term unemployed.

8. How Useful are Flows Data in Forecasting, Policymaking and Commentaries?

This section considers, very briefly, the potential usefulness of labour flows data in the areas of forecasting, policymaking and economic commentaries. We begin with forecasting and Kuroka's study (2003) testing the hypothesis that flow rates between employment and unemployment (that is, the *eu* and *ue* transitions) provide better forecasts of Japanese inflation between 1986 and 2000 than the level or change in the unemployment rate or output gap measures. His core specification is a Phillip curve-type equation:

$$\pi_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i \pi_{t-i} + \beta_1 flow_{t-1} + \gamma_1 imp_t + \varepsilon_t \qquad (8)$$

where π is the rate of inflation, *flow* is a transition probability (such as *ue* or *eu*), *imp* is import prices and ε is an error term. Kuroda has five inflation lags and most of them are significant. He finds, overall, that variables that reflect directly the dynamics of the Japanese labour market, such as flows data, outperform the unemployment rate (which is an aggregation of all flows data) and output gap measures in forecasting inflation.

Using equation (8), we conducted some very preliminary experiments with New Zealand data. Our results are summarised in Table 8. They compare unfavourably with Kuroda (2003). The coefficients on our flow variables and import prices are not significant in any of our specifications and the best result we could achieve used two lags on inflation. In addition, our adjusted R-squared is less than 0.30 while Kuroda's was 0.87. Despite these results, and given Kuroda's persuasive findings for Japan, further experiments may be worthwhile with New Zealand data.

Table 8. Inflation Equations for New Zealand using Flows Data
Dependent Variable: Current Inflation, Quarterly, 1986-2010

Constant	π_{t-1}	π_{t-2}	ue_{t-1}	eu_{t-1}	imp_t	R^2
1.51 (1.20)	0.28 (2.7)	0.24 (2.4)	2.11 (1.13)		-0.00 (1.6)	0.29
2.05 (1.54)	0.31 (3.0)	0.26 (2.6)		-1.11 (0.50)	-0.00 (1.4)	0.28
	0.28 (2.7)	0.25 (2.4)	2.97 (1.49)	-2.17 (0.90)	-0.00 (0.7)	0.28

Note: *t*-statistics are in parenthesis.
Source: Statistics New Zealand and authors' calculations.

The second area on which we comment very briefly relates to the potential policy usefulness of gross flows data. Figure 3, for example, provided the information that some countries were more successful than others in having higher outflow rates from unemployment to employment. This information could strengthen the argument that employment protection legislation (EPL) is a contributing influence on the pace of outflow rates from unemployment. If so, what are the policy options? Flows information on the employment prospects of workers with and without school and post-school qualifications and insights from flows-based age, gender and ethnic factors are further examples of the potential usefulness of gross flows data for ;policy analysis.

Finally, in this section, there is the issue of whether to include labour force flows data in official public sector announcements and in private-sector economic commentaries. Given the problems with flows data, it is understandable there has been some reluctance by statistical agencies to include aspects of flows data, such as the proportions and probabilities of status changes, in economic commentaries. Hopefully, this situation will change as more statistical agencies are able to reconcile gross flows data with their full household labour force survey outcomes and the data becomes more easily available.

9. Conclusions and Further Work

We have, in this paper, confronted New Zealand's labour market flows data from 1986 to 2010 with seven questions and offered a series of answers. We conclude the paper with selected findings from each of the questions we posed in Section 1. First, we found that New Zealand's labour market, like many others, is highly dynamic with around 10 percent of matched respondents in the Household Labour Force Survey changing their status between quarters, from, say, unemployment to employment. Flows to and from non-participation are also important and this finding may hold the key to good labour market performance.

Secondly, around 60 percent of the unemployed leave unemployment each quarter, on average, to either employment or to non-participation. Not unexpectedly, a mix of changes in the inflow and outflow rates have influenced the unemployment rate. Sometimes these changes have worked together in the same direction, sometimes in the opposite direction and sometimes singly.

Thirdly, there are gender, age and ethnic differences in the probabilities of moving between different labour market states. Some of these differences are significant such as relatively unfavourable Maori outcomes.

Fourthly, almost all the transition probabilities are either pro-cyclical or counter-cyclical. The important job finding rate (*ue*), for example, has ranged from a low probability of leaving unemployment of around 25 percent a quarter during recession times to over 40 percent in more prosperous times. Trend and cyclical influences are similar for males and females with differences related mainly to movements to and from non-participation.

Fifthly, New Zealand's flows data are vulnerable to bias from incorrect data entry and to faulty, or deliberately false, recall by respondents. These classification errors lead typically to the overstatement of labour force movements. We have found, for example, that around 12 to 15 percent of the employment to unemployment flow (*EU*) is probably classified incorrectly.

Sixthly, micro and macro-econometric gross flows modelling has revealed some interesting findings. New Zealand micro research includes the results that a person with both school certificate and post-school qualifications is almost twice as likely to obtain employment in the following quarter compared to a person with no qualifications and that part-time job seekers have a similar chance of finding work as full-timers. New Zealand macro findings include the controversial result that a sales constraint, rather than structural changes, was the main determinant of inflows and outflows to unemployment in the decade following the post-1984 reforms.

Finally, gross flows data has been found to be useful in macroeconomic forecasting and potentially useful in labour market policymaking and in public and private sector economic commentaries.

Future work will include the reconciliation of gross flows outcomes with the Household Labour Force Survey in the spirit of recent US work (see, for example, Boon *et al.* 2008, Frazis *et al.* 2005 and Llg 2005). The role of non-participation, the role of gross flows in inflation forecasting and as a leading indicator of labour market performance and a study of the relationships between job flows and worker flows are further possibilities.

New Zealand's labour market flows data have been studied by academic researchers for more than two decades. The potential usefulness of their research, however, has been almost totally neglected in published economic commentaries, forecasting and modelling activities and policy debates. Wider use of New Zealand's labour flows data might occur if internet access to the data was available from the Statistics New Zealand website and if official commentaries included an analysis of the changes, and probabilities of changes, in labour market status.[2]

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[2] Elsewhere, official gross flows data are available on the internet. See, for example, Australian data at www.abs.gov.au and then select 'Labour Force/Downloads/Data Cubes'; experimental UK data at www.statistics.gov.uk and then select 'Browse by Theme/Labour Market/Employment/ONS Labour Market Statistics/Labour Market Overview/Annex 4 Labour Force Survey' and US data at http://www.bls.gov/cps/cps_flows.htm and then select 'cps_flows_history' in pdf or txt format.

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