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Construction of Australian labour market flow data, 1980:I – 2002:III

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1 Introduction

The Australian Bureau of Statistics (ABS) has published estimates of labour force status and gross changes (flows) derived from matched records of the Labour Force Survey on a monthly basis since February 1980. The categories of labour force status are full-time employed (defined as being 35 or more hours of work per week), part-time employed, unemployed, not in the labour force with the data also being publicly available for males, married females, all females and persons. In this paper we concentrate on three states: employed (*E*), unemployed (*U*) and not in the labour force (*N*) for persons aged 15 years and older. Hence the flow *EN* captures the number of persons who were employed in period *t* and are now not in the labour force in period *t*+1 (for example, as a result of retirement). Similarly, the flow *UU* refers to all persons who were unemployed in both periods. A good description of these data and the problems inherent can be found in Dixon (2002).

Given that the data is based on a matched sample there are strains on maintaining a representative sample over time. Dixon (2001: 1 and 3) notes that "slightly over 20% of the population are not represented in the matched sample … [due to] … the exclusion of respondents in non-private dwellings, sample rotation and 'non-response' by persons in the survey in the previous month." As a consequence, Dixon (2001) shows (largely due to the exclusion of respondents in non-private dwellings) that there is some under-reporting bias of persons who are unemployed and/or not in the labour force. Actually, the response rate of around 80 per cent is quite favourable when compared to the response rate of 60 per cent reported by Blanchard and Diamond (1990) for the U.S. CPS data. Moreover, comparable exercises for the U.S. using CPS data, encounter severe problems with classification error due to a lack of clarity in the distinction between unemployed and 'not in the labour force' (see for example, Blanchard and Diamond, 1990). Dixon (2002) gives no indication of these problems in his extensive study of the sources of potential bias of the unemployment data published in the Labour Force Survey.

In this paper, we outline the methodology used to construct the data set that is used in later flow analyses of job creation (JC) and job destruction (JD) in Australia. First, we explain how we deal with missing observations and transform the monthly data in a quarterly periodicity. Second, we show how we correct for potential reporting biases by reconciling the flow data in period *t* with the stock data for employment (E_t), unemployment (U_t) and not in the labour force (N_t). These data are taken from the monthly Labour Force survey published by the ABS.

We first indicate the general problem, then we present three alternative solutions, two of which we have used in our empirical work. Finally, we provide a brief insight into the JC and JD measures that are derived from the transformed flow data. Concluding remarks follow.

2 Missing observations and transformation to quarterly data

Initially, the monthly flow data was transformed into quarterly centred-averages. However, this process was complicated by the occurrence of breaks in the ABS data when the "size of the matched sample was abnormally low due to a new sample being rotated (October 1982, September-December 1987, September-December 1992 and September-October 1997) and the period when telephone interviewing was being phased-in (August 1996 – January 1997)" (Dixon, 2001: 5). In this regard, the August 1982 quarter was computed as the average over two months (July-August, August-September with September-October excluded). For the August and November 1987 quarters, the observations used were July-August 1987 and December-January 1988, respectively; and similarly for the August and November 1992 quarters, the July-August 1992 and December-January 1992 flows, respectively, were used. Finally, the observation for August 1997 was suspect and a linear interpolation across the two adjacent averages was used.

3 Reconciling flow and stock data

3.1 The problem

The relationship between stock and flow data is summarised in Table 1 subject to the implicit assumption that the population is constant, since all column sums should equal the respective row sums. However, in reality these sums do not have to be equal as a consequence of persons dying or emigrating and thus 'flowing out' of the system in addition to inflows resulting from 'births' in the form of school leavers and from immigration. In principle, these extra flows should be modelled (see Mitchell and Muysken, 2002).

Table 1 Stocks and flows on the labour market with static population

	E_{t+1}	U_{t+1}	N_{t+1}
E_t	EE_t	EU_t	EN_t
U_t	UE_t	UU_t	UN_t
N_t	NE_t	NU_t	NN_t

3.2 Correcting for migration, births and deaths

We noted that the discrepancy between the labour force stocks and the gross flows is not due only to the problem of sample bias. Discrepancies can also arise as a result of persons dying/emigrating and/or leaving school/immigrating. For example, we should find that $E_t = EE_t + EU_t + EN_t + ED_t$, where ED_t is the outflow from employment to either death or emigration in period t. Similarly, we should take UD_t into account when reconciling the flows with U_t and ND_t with N_t.

Migration and death rates are published by the ABS on a yearly basis (Cat Nos. 3412.0 and 3303.0, respectively). Unfortunately, they do not present a break down in terms of the three labour market states we are working with. To reconcile the flows with stocks and to take into account the additional flows we have identified above, we assume that the emigration and death rates of persons in the 15-64 years age group are relevant and equal for those who were employed and unemployed in the previous period. We also use the emigration and death rates applicable for the 65 years and higher age group for those that were not in the labour force in the previous period. These assumptions appear to be reasonable and given the small magnitudes under consideration we believe they would not fundamentally alter the basic insights.

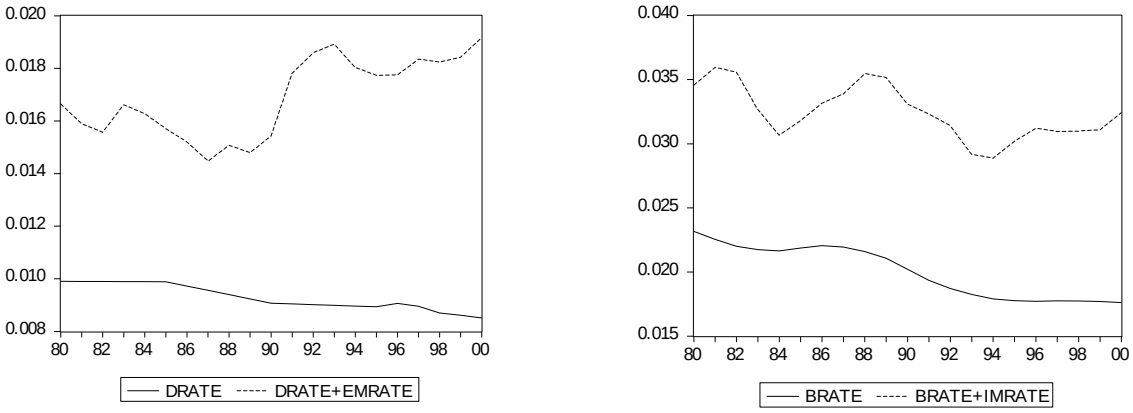
The break down in age categories for the death rate is based on observations for 1980, 1985, 1990, and the years 1995 to 2000. The breakdown for emigration is based on observations for 2000. Table 2 presents the results for 1980 and 2000.

Table 2 Emigration and death rates per 1000 persons.

	Emigration		Death	
	15-64	65+	15-64	65+
1980	5.44	0.20	2.86	7.04
2000	9.12	0.34	1.69	6.82

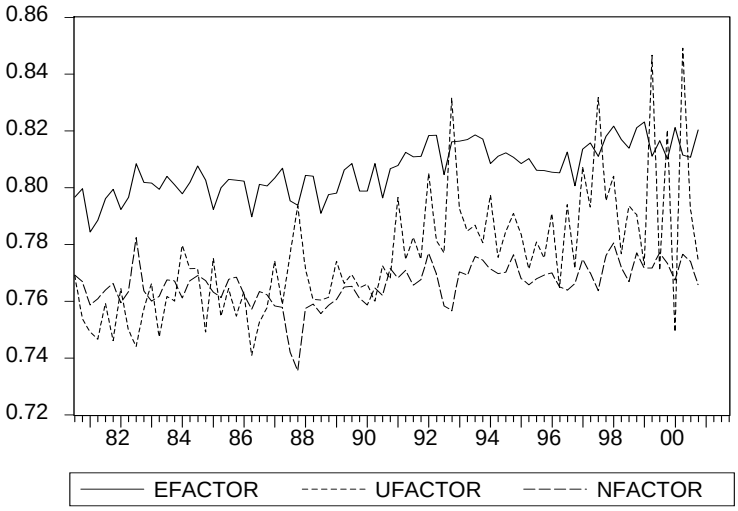
The information in Table 2 table shows while the death rate has declined over the 20-year span the emigration rate has almost doubled. Closer inspection of the data (see Figure 1) shows that emigration is pro-cyclical, as one might expect. However, the death and emigration rates taken together, m_t, never exceed one per cent for the relevant age categories, noted above.

Figure 1 Outflow and inflow rates of population of age 15 and older



We seasonally adjusted the quarterly data using the X11 option in EViews 4.1 and further transformed the yearly data for migration rates into quarterly observations by linear interpolation. The final exercise was to complete an accounting reconciliation of the quarterly flows with the corresponding stocks. For example, the data for outflows from employment was corrected by a factor $(1\text{-}m_t)E_t /(EE_t + EU_t + EN_t + ED_t)$. The factors that were used to correct each category are shown in Figure 2 and are consistent with the range reported by Dixon (2002). The factor for the employment flows fluctuates in the range 0.79 to 0.82 over the sample, whereas the other two factors (unemployment and not in the labour force) fluctuate between 0.75 and 0.80.

Figure 2 Flow correction factors for employment, unemployment and not in the labour force



The constructed flow data is summarised in Table 3. The adjusted flows obey accounting constraints and add up consistently row-wise. That is, the stock at the beginning of quarter *t* should equal all outflows during that quarter. For example, $E_t = EE_t + EU_t + EN_t + ED_t$. However, it is clear that the accounting constraints also require that Table 3 add up consistently column-wise, provided the inflows from births (after 15 years) and immigration are allowed for. Thus the stock at the beginning of quarter *t+1* should be equal to all inflows during quarter *t*. For example, in the case of employment, $E_{t+1} = EE_t + UE_t + NE_t + BE_t$, where BE_t is the inflow in employment from outside the current population due to immigration and births.

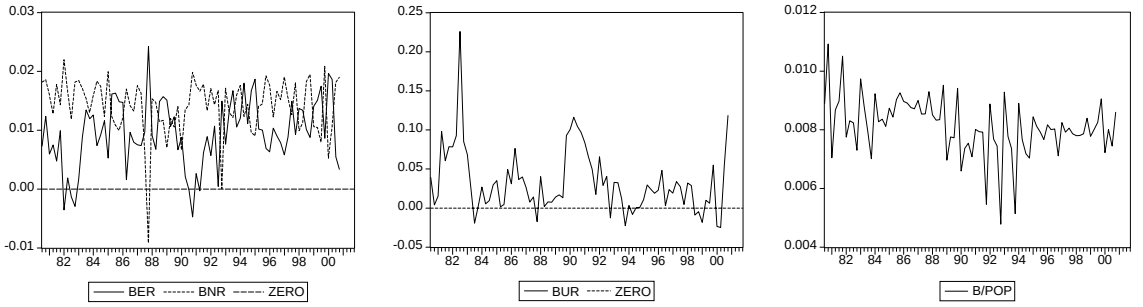
Table 3 Stocks and flows on the labour market with changing population

	E_{t+1}	U_{t+1}	N_{t+1}	Death and emigration*
E_t	EE_t	EU_t	EN_t	ED_t
U_t	UE_t	UU_t	UN_t	UD_t
N_t	NE_t	NU_t	NN_t	ND_t
Birth and immigration*	BE_t	BU_t	BN_t	

* These are flow variables, from and to outside the working age population (15 years and over).

We have no information on the distribution of immigration and births with respect to the three categories. Therefore we calculated the inflow consistent with Table 3 and checked whether the corresponding inflow rates seem plausible. Thus in the case of employment we calculated $BE_t = E_{t+1} - EE_t - UE_t - NE_t$, and the corresponding inflow rate is BE_t / E_{t+1}.

Figure 3 Inflow rates from birth and immigration in employment, unemployment and not in the labour force



(a) (b) (c)

These rates are almost always positive as is shown in Figure 3. Moreover, the inflow rates into unemployment and into not in the labour force are clearly counter-cyclical (see Figure 3b and 3c), whereas the inflow rate into employment is pro-cyclical (Figure 3a). This is also consistent with *a priori* expectations. Finally, the size of the rates reflects that population is growing over time. Whereas inflow into employment (around 1 per cent) is somewhat higher than outflow due to death and emigration, inflow into not in the labour force (around 1.5 per cent) is distinctly higher. This includes both accompanying family members and immigrants seeking a job who are not registered as unemployed. Finally the rate of inflow into unemployment is much higher and strongly counter-cyclical, as might be expected. These observations lead us to conclude that the flow rates we have calculated provide a reasonable description of the dynamics of the Australian labour market. However, a comparison of the implied total inflow rate in Figure 3c with the observed rate in Figure 1 shows that we underestimate total inflow somewhat. This discrepancy was overlooked in Mitchell and Muysken (2000) when the factors presented in Figure 2 were used to correct the various cells of the matrix row-wise.

4 Intermezzo: distinguishing between long and short-term unemployment

In Mitchell and Muysken (2002) we also distinguish between long and short-term unemployment. But since we have no data on the flows into and out of short- and long-term unemployment, we include the figures on the stocks of these variables in our analysis. There are thus six unidentified flows in our model (shown in Table 4) if we assume that the death and emigration rate are the same for short- and long-term unemployed. The inflow into unemployment from employment, non-labour force and births and immigration by definition goes through short-term unemployment. This also implies that the short-term unemployed that remain in that category during a quarter, $U^SU^S_t$ can be identified from the data. The remaining flows, U^SE_t, U^LE_t, $U^SU^L_t$, $U^LU^L_t$, U^SN_t and U^LN_t cannot be identified without further assumptions.

To identify these flows we distinguish two scenarios with respect of the outflow from unemployment to the non-labour force, reflecting two extreme assumptions. In Scenario 1 we assume that all outflow occurs through long-term unemployment, that is $U^SN_t = 0$ and $U^LN_t = UN_t$. Scenario 2 adopts the other extreme assumption that the outflow rate from short-term unemployment is equal to that of long-term unemployment and hence that of total unemployment un_t. Hence $U^SN_t = un_t\ U^S_t$ and $U^LN_t = un_t\ U^L_t$. These scenarios allow us to

calculate the flows $U^S E_t$, $U^L E_t$, $U^S U^L{}_t$ and $U^L U^L{}_t$. They will be denoted by the subscripts 1 and 2, respectively.

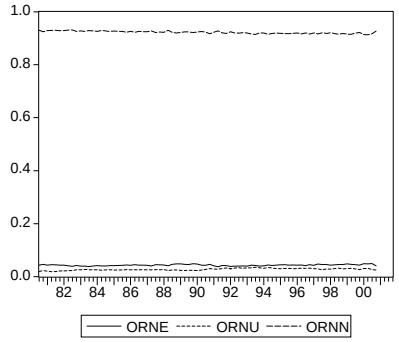
Table 4 Flows on the labour market with short- and long-term unemployment

	E_{t+1}	US_{t+1}	UL_{t+1}	N_{t+1}	Death and emigration*
E_t	*EE*	*EU*	*0*	*EN*	*ED*
US_t	*USE*	*USUS*	*USUL*	*USN*	*mUS*
UL_t	*ULE*	*0*	*ULUL*	*ULN*	*mUL*
N_t	*NE*	*NU*	*0*	*NN*	*ND*
Birth and immigration*	*BE*	*BU*	*0*	*BN*	

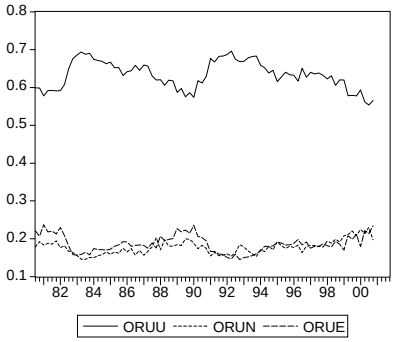
* These are flow variables, from and to outside the working age population.

We present some of the resulting flows below. Figure 4a shows the outflow rates from not in the labour force – the rates from employment are higly similar. One sees that the incidence of persons remaining in the same state is very high. From Figure 4b one sees that also the incidence of unemployed persons to remain unemployed is rater high: between 60 and 70 per cent. It also varies clearly in a counter-cyclical way. Outflow from unemployment to employment and the non-labour force are at almost the same rate, around 20 per cent. They fluctuate pro-cyclically.

Figure 4 Outflow rates from in not in the labour force and from unemployment



(a) Outflow rates from NLF

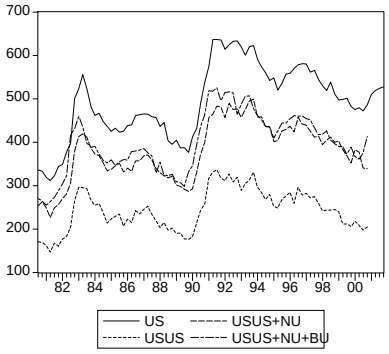


(b) Outflow rates from UN

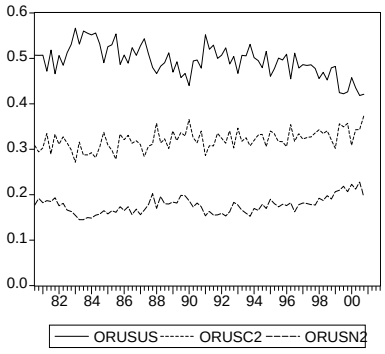
Since short-term unemployment makes up the largest part of unemployment, we consider this in more detail in Figure 5. The outflow rate from short-term unemployment is around 50 per cent, which implies unemployment duration of around two quarters. Outflow to employment is about 30 per cent and the remaining part goes to non participation (in Scenario 2). It is

remarkable that all rates are quite stable over time, in spite of the strong fluctuations in short-time unemployment.

Figure 5 Flows into and outflow rates from short-term unemployment



(a) Inflows to short-term unemployment



(b) Outflows from short-term unemployment

5 Direct correction of job creation and job destruction data

In Mitchell and Muysken (2003) a different method to correct for consistency with stocks is employed since the procedure described in this paper has two disadvantages: (1) all cells were corrected row-wise with the same factor; and (2) the implied birth rates did not fit the data precisely, in part because we used the precise death rates. Since we are only wishing to generate time series to model the processes of job creation (*JC*) and job destruction (*JD*), we decided to concentrate on flows that impacted directly on *JC&JD* rather than worry about strict accounting constraints that were not binding. To provide a summary of the *JC&JD* work, we initially develop two supply-side measures of labour market dynamics using the gross flows data derived from the ABS labour force survey: (1) gross job finding (*JF* = *UE* + *NE*); and (2) gross job separation (*JS* = *EU* + *EN*). Ritter (1993) shows that the dynamics of *JC* and *JF* are closely linked as are *JD* and *JS* for the U.S. labour market. In other words, the *JF* and *JS* time series can provide valuable information about the dynamics of *JC&JD*.

The manipulation of the gross flows data ensured that all flows were consistent with the initial stock, by correcting each row element with stock/row-sum. In turn, consistency for column totals was obtained by calculating the gap:

$$GAP = E(+1) - E - JC + JD$$

The corrections to the *JC* and *JD* time series relied on the following adjustments:

$$JC_c = JC + xGAP$$
$$JD_c = JD + (1-x)GAP$$

where $x = JC/(JC + JD)$.

This procedure ensures that consistency between stocks and flows is obtained. The resulting correction factors are presented in Figure 6 under the heading COR1 for males and females and full-time (FT), part-time (PT), unemployment (U) and not in the labour force (N), respectively. The stock/row-sum factors are presented under the heading CORR. The resulting flows for *JD* and *JC*, together with the original data are presented in Figure 7.

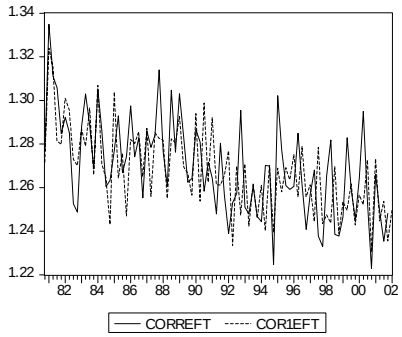
To gain more insights into the constructed flow data time series, we compared them to results for the U.S. as reported in Ritter (1993). Since Ritter reports his findings using monthly data, we transformed his results to quarterly data to provide a valid comparison with our data. We also compared our results with those for the U.S. as reported in Blanchard and Diamond (1990). This yielded similar results as reported above From Table 5 one sees that inertia in Australia is quite similar to that exhibited by the U.S. data. An implication of this similarity is that the notion that the Australian labour market is unduly constricted by government labour regulations does not appear to be supported by the dynamics of the flows data. This is consistent with Mitchell (2001) who argued that the Australian and U.S. labour markets are distinguished mainly by the way public sector job creation has changed since the 1970s. Most of the higher unemployment in Australia compared to the U.S. can be explained by the discretionary reductions in Australian public sector employment.

Table 5 Composition of working age population and monthly rate of inertia in the USA and Australia, 1996-II

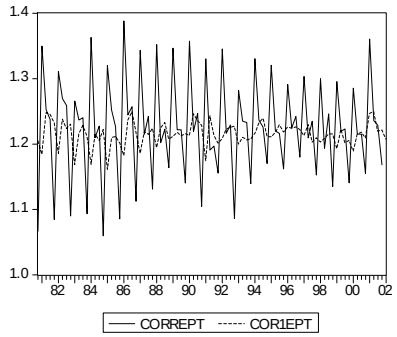
	Rate of inertia		Share in population	
	US	Australia	US	Australia
E	0.96	0.96	60.1	55.6
U	0.72	0.68	6.0	6.8
N	0.93	0.92	33.8	37.6

Source: Ritter (1993, Fig. 4) and own data.

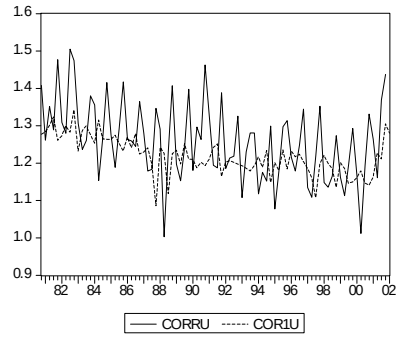
Figure 6 Correction factors for females and males



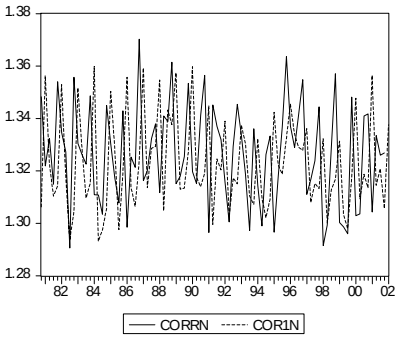
(a) Females –full-time employment



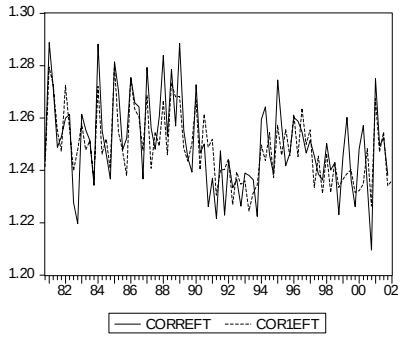
(b) Females – part-time employment



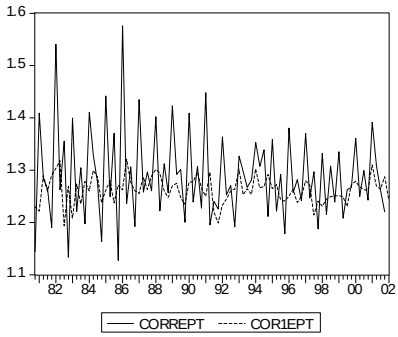
(c) Females - unemployment



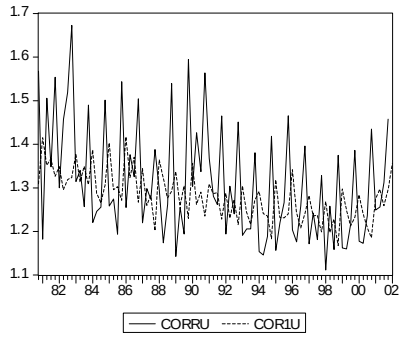
(d) Females – Not in the labour force



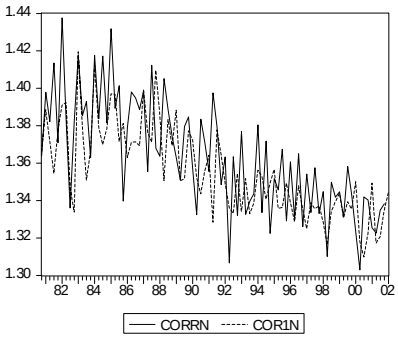
(e) Males – full-time employment



(f) Males – part-time employment

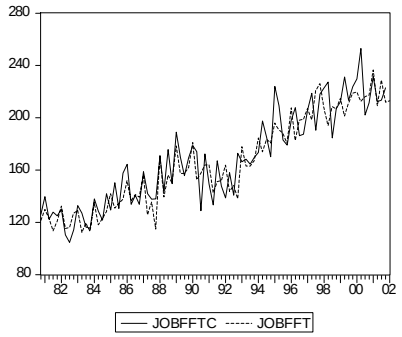


(f) Males - unemployment

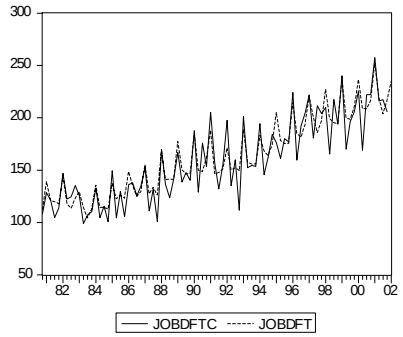


(g) Males – not in the labour force

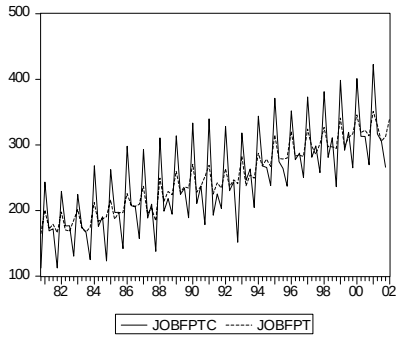
Figure 7 Female and male full-time and part-time JC and JD rates, 1980 to 2002



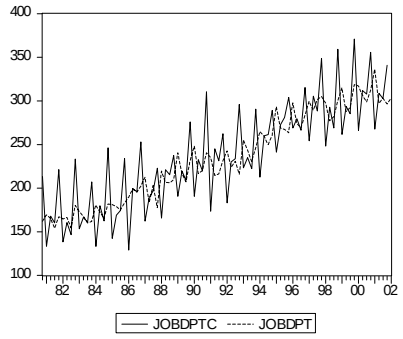
(a) Females –full-time Job Finding



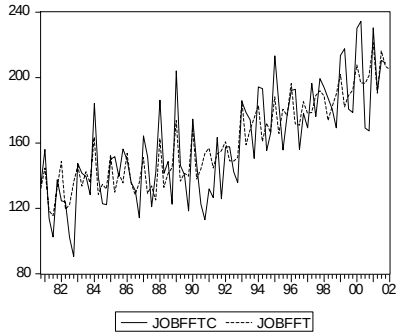
(b) Females – full-time Job Destruction



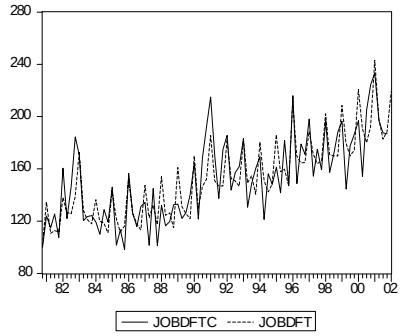
(c) Females – part-time Job Finding



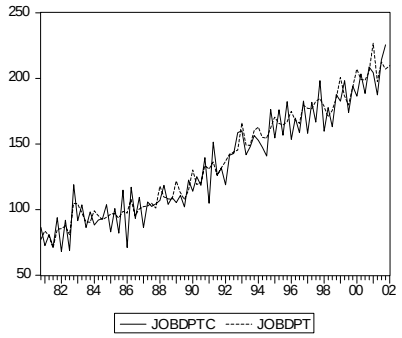
(d) Females – part-time Job Destruction



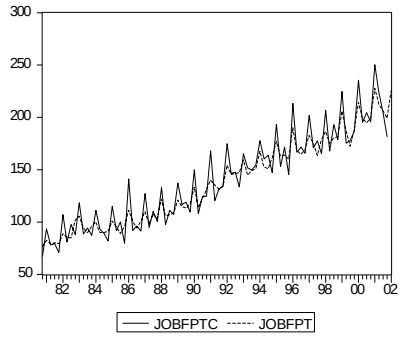
(e) Males – full-time employment



(f) Males –full-time employment



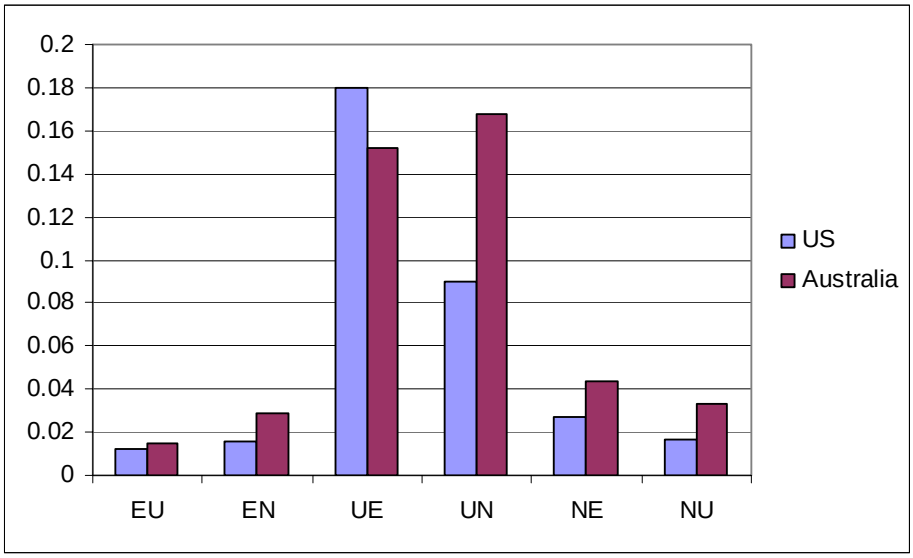
(f) Males - part-time Job Finding



(g) Males – part-time Job Destruction

As a final point of interest, in Figure 8 the monthly outflow rates for the U.S. and Australia are compared as at the second quarter 1996. The U.S. results are taken from Ritter (1993). The similarity between the two countries is once again notable and at face value one could not reject the hypothesis that the Australian labour market is as dynamic as the U.S labour market as measured by the gross flows. A qualification to this relates to the *UN* flow which is clearly much lower for the U.S. relative Australia. This could suggest that there are more compelling reasons in the U.S. for marginally attached workers to remain in the labour force rather than drop out as is common in Australia. This may also explain the lower estimates for hidden unemployment for the U.S. relative to Australia (see Mitchell, 2001).

Figure 9 Monthly outflow rates for USA and Australia, 1996-II



Source: Ritter (1993) and authors' own calculations

Conclusion

In this paper, the technical details underlying the creation of a consistent labour market gross flows dataset from the ABS published series have been outlined. The resulting database has been used in two additional papers Mitchell and Muysken (2002) and the Mitchell and Muysken (2003).

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