Displaced workers in Australia 1984-1996: Macroeconomic Conditions and Structural Change

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Abstract

This paper examines the incidence of worker displacement in Australia between 1984 and 1996. Similar to recent international studies a particular focus is on whether job security declined between the 1980s and 1990s. It is found that a significant, but apparently temporary, increase in the incidence of displacement did occur at the beginning of the 1990s. This rise in the incidence of displacement was concentrated amongst workforce groups with low levels of educational attainment, and in blue-collar or low-skill white-collar occupations. It is possible to conclude that the main potential explanations for the higher rate of displacement are either an increase in the extent of intra-industry workforce adjustment, or a rise in the extent to which organisations used displacement as a method for adjusting their workforces.

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I. Introduction

During the 1990s in many industrialised economies there has been considerable interest in the phenomenon of job security – the likelihood of workers experiencing involuntary job loss. In a large part this interest appears to have been motivated by a belief – widely propagated in the popular media - that a significant increase in the incidence of involuntary job loss has occurred. Anecdotal evidence of greater job insecurity, and changes in the structure of those industrialised economies – through corporate downsizing; government sector reform; increased usage of temporary help and contract workers; and the combined forces of trade liberalisation and technical change – which have been interpreted as likely causes of higher rates of involuntary job loss, seem to have been the initial sources of this belief. The potential implications of declining job security for workers' welfare, and for labour market outcomes such as wage inflation and the NAIRU have meant that the topic has been the subject of much attention (see for example, Aaranson and Sullivan, 1998, and Katz and Krueger, 1999).

The objective of this study is to describe the determinants of the incidence of involuntary job loss for individual workers in Australia between 1984 and 1996. A particular focus is on the question of whether job security has declined in Australia between the 1980s and 1990s. The data source used in the study is individual-level data from the Australian Bureau of Statistics (ABS) *Labour Mobility Survey* that is available for seven years between 1983/84 and 1995/96.

The study seeks to make two main contributions to the literature on job security and displaced workers. First, it represents a significant addition to understanding of worker displacement in Australia, being the first analysis of the determinants of displacement and time series patterns in worker displacement using individual-level data from a general population survey. Second, and of more direct relevance to the international literature on job security, the paper undertakes a detailed investigation of time-series changes in worker displacement.

Thus far, much of the international literature has taken a fairly simple approach to analysis of changes over time in worker displacement. Most studies seek to measure

structural change in worker displacement through a trend variable, and to control for cyclical effects using an unemployment rate variable. The studies for the most part also do not undertake analysis of possible causes of structural change in worker displacement. This paper attempts to undertake a more detailed analysis of the nature of structural change in worker displacement, and to analyse the effect of alternative approaches to controlling for cyclical effects. In addition, it sets out a simple conceptual framework for understanding possible determinants of structural change in worker displacement.

The approach adopted in the paper provides some new insights into changes over time in worker displacement. For example, our conclusion that some structural increase in the incidence of worker displacement did occur on the early 1990s, but that the magnitude of the increase appears to have decreased by the mid-1990s, raises the question of whether structural changes in the incidence of worker mobility are a permanent or temporary phenomenon. This is a question that could also be examined for other countries. What is required is an empirical approach that distinguishes between fairly narrowly defined time periods, and seeks explicitly to distinguish between effects of structural change and the business cycle.

In section II a brief review of relevant literature is presented. Section III describes the data source for the study and variable definitions, and presents descriptive statistics. Section IV presents the findings of regression analysis of the determinants of the incidence of involuntary job loss, and section V examines in more detail the possible sources of structural change in the incidence of involuntary job loss. Concluding remarks are in section VI.

II. Literature

Existing studies of involuntary job loss and displaced workers have been primarily concerned with questions regarding the incidence and determinants of involuntary job loss, and with the consequences of job loss such as the length of spell out of employment, and the effect on labour market earnings. For the most part this literature has involved analysis of North American labour markets (for reviews see Hamermesh, 1989; Fallick, 1996; and Kletzer, 1998).

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Some fairly robust findings on the determinants of involuntary job loss appear to come from these studies. The rate of involuntary job loss is counter-cyclical; and the probability of involuntary job loss is higher for blue-collar workers, workers with low tenure and low educational attainment, and working in goods producing industries.

An issue addressed in a growing body of recent studies is whether there has been a decline in job security in the United States since the 1970s. Early studies tended to conclude that an increase in the incidence of involuntary job loss had occurred, but reached different conclusions on the exact timing of the increase and on the relative magnitude of the increase across different skill groups.

Farber (1997a) using data from the Displaced Worker Survey (DWS) concludes that an increase in involuntary job loss occurred between the 1980s and 1990s, and that this increase was particularly pronounced for high education workers. Aaaranson and Sullivan (1998) also examine the DWS data and reach the same conclusion on the overall time-series change in the incidence of displacement. In addition they suggest a 'democratization' whereby the probability of involuntary job loss for workers in white collar occupations, with a university degree, and in service industries increased relative to other groups. Monk and Pizer (1998) using National Longitudinal Survey of Youth (NLSY) data from between 1979 and 1990 find an upward trend in involuntary job loss. That study however finds that the trend for high education workers was not as strong as for other groups. Bosjoloy et al. (1998) examine Panel Study of Income Dynamics (PSID) data from 1968 to 1992. Their study finds an increase in the incidence of involuntary job loss between the 1970s and 1980s, and that the increase was of similar magnitude across education groups. Polsky (1999) uses the same data source for the years 1976-81 and 1986-91 and concludes that the probability of involuntary job loss was significantly higher in the latter period.

Subsequent research has sought to reconcile some of the differences that exist between these studies. It has generally confirmed the finding of an increase in involuntary job loss but seems to suggest that the timing of the change has been more narrowly concentrated – from the 1970s to 1980s – than was found in the earlier studies. Studies by Stewart using data on employment to unemployment transitions from the CPS, and by Gottschalk and Moffitt using the PSID, reported in Neumark

(2000), both find evidence of a decline in job security between the 1970s and 1980s, but not into the 1990s. It is suggested that one explanation for the finding of an increase in involuntary job loss from studies using the DWS is likely to be changes in the questions in that survey (see also Abraham, 1997). As well, Gottschalk and Moffitt's (1999) study of monthly job separation rates using data from the Survey of Income and Program Participation (SIPP) from 1984-85 to 1994-95 does not find any evidence of a trend increase in involuntary job separations.

Other related research for the United States has examined whether the distribution of duration of job tenure has altered significantly, and whether workers' perceptions of job security have changed. Data on the distribution of job tenure from the Current Population Survey (CPS) and PSID appear to indicate that job tenure was relatively stable in the 1970s and 1980s with some decline in stability for high tenure workers in the 1990s (see for example, Farber, 1997b, Jaeger and Huff Stevens, 1999, Neumark, 1999, and Neumark et al., 1999). Findings from the NLSY differ somewhat showing a trend increase in involuntary separation rates from the 1970s to early 1990s (Monks and Pizer, 1998, and Bernhardt et al., 1999). Aaranson and Sullivan (1998) and Schmidt (1999) both examine data on workers' perceptions of job security from the General Social Survey (GSS) and find an increase in the probability that workers believed they were very likely or fairly likely to lose their jobs in the 1990s relative to the 1980s.

The literature on involuntary job losses for other countries is not as extensive as for North America (although see Kuhn, 2000). For Australia Borland (1998) reviews available aggregate level evidence on the incidence of displacement and case study evidence on the costs of worker displacement; Borland et al. (2000) examine costs of involuntary job loss for a sample of young workers between 1981 and 1993; and McDonald and Felmingham (2000) present aggregate level evidence on the incidence of involuntary job loss in Australia between 1987 and 1996. Other related studies are Kilpatrick and Felmingham (1996) which examines the determinants of overall job mobility; Wooden's (1998) study of the distribution of job tenure in Australia between 1975 and 1998; and Borland (1999) which analyses data on workers' perceptions of job security between the 1980s and 1990s in Australia.

The existing research for Australia is limited, but does reveal several common themes. The incidence of involuntary job loss is counter-cyclical; and there is some aggregate-level evidence of a slight upward trend in the rate of displacement between the 1980s and 1990s. Perceptions of the probability of involuntary job loss display a strong counter-cyclical pattern, but no strong trend is evident in the period between the mid 1970s and late 1990s. Finally, no trend however is evident in overall rates of job mobility, and the proportion of workers with high years of job tenure (10+) has increased (especially for females) over the same period.

III. Data source, variables and descriptive statistics

Data from the ABS *Labour Mobility Survey* – a supplementary survey to the monthly household *Labour Force Survey* - is used to study worker displacement. The survey – which has primarily been undertaken on a biennial basis - provides a range of information on job mobility experience in the twelve months preceding the survey, job characteristics, and demographics of survey respondents. In this study individual-level data from seven surveys that were conducted in February 1984, 1987, 1989, 1991, 1992, 1994 and 1996 is used. [1] Each survey is from a different population sample so that the data set consists of a series of cross-section surveys and does not have any panel data characteristics.

To measure the incidence of involuntary job loss we use information from the variable 'reason for ceasing last job'. For respondents who held a job at some time during the twelve months preceding the survey it is possible to identify whether a person ceased a job during the period, and for those persons who did cease a job to identify the reason for ceasing the last job held. The classification of reasons for ceasing last job is presented in Table 1. For this study any worker whose reason for ceasing last job is identified as 'retrenched' is defined as an involuntary job loser.

Hence, our sample of displaced workers is persons who held a job during the preceding twelve months, who ceased a job, and whose reason for ceasing their last job was that they were 'retrenched' from that job. The overall population sample is any person who held a job during the preceding twelve months. Attention is restricted

to persons aged 20-64 years, who have job tenure of more than one year (or had tenure of more than one year at the time at which they were retrenched), and who do not have missing information on the 'industry in last job' variable.

An issue regarding the definition of a displaced worker in this study is that the category 'retrenched' as a response to the question on reason for ceasing last job incorporates several types of reasons for job loss – dismissal due to business closing; dismissal for reasons of insufficient labour demand that does not involve a business closure; and dismissal for poor performance for reasons unrelated to demand conditions. Of these reasons generally only the first two – which relate to demand conditions – would be thought of as worker displacement. Unfortunately the unit-record files of the *Labour Mobility Survey* do not permit disaggregation between these types of reason for retrenchment.

Some evidence on the implications of adopting this definition of a displaced worker is available from ABS publications reporting findings from the *Labour Mobility Survey* between 1978 and 1985. For seven years in this period the ABS publication *Labour Mobility Australia* (catalogue no.6209.0) reports numbers of workers who were retrenched due to 'no work' and due to 'other reasons'. Two points stand out from an analysis of these data. First, on average about 75 per cent of workers are retrenched for the reason 'no work'. Second, most of the time-series variation in total retrenchments is associated with variation in retrenchments that occur due to 'no work'. Variance decomposition finds that about 85 per cent of the variance in total retrenchments is due to variance in the 'no work' retrenchment series. [2] Hence, it appears that analysis of the determinants of worker displacement using the 'retrenched' category from the *Labour Mobility Survey* will primarily reflect the experiences of workers retrenched for reasons relating to adverse demand conditions.

Another issue regarding the identification of displaced workers and the population of workers in this study is that the ABS *Labour Mobility Survey* only identifies (at most) one episode of displacement for each worker, and incorporates details on one job held by a worker during the sample period. Hence, there will be some under-statement of displacement, and the number of jobs held during each sample period. This is not,

however likely to be a significant problem. Analysis of other information suggests that the available data under-state both total displacements and total jobs by no more than fifteen per cent. [3]

The restriction of the sample to workers with more than one year of tenure is adopted for the purpose of consistency with other studies. [4] Most international studies restrict attention to workers with more than some threshold level of job tenure (for example, Kuhn, 2000). The main reasons for this restriction appear to be that workers with low levels of job tenure are unlikely to suffer significant costs from displacement; and that there may be more error in survey responses on reason for job loss from low tenure workers. The exclusion of low tenure workers from the sample causes a lower average rate of retrenchment – since the rate of worker displacement is about four to five times higher for workers with less than one year of job tenure compared to workers with more than one year (McDonald and Felmingham, 1999). However, including the group of low tenure workers does not significantly alter any of the findings on the determinants of worker displacement that are subsequently reported.

Some studies that examine the incidence of worker displacement restrict attention to wage and salary earners. With this restriction groups such as employers and self-employed workers are excluded. The motivation for this restriction is presumably that groups such as the self-employed do not experience involuntary job loss in the way that is encapsulated in the term 'displaced worker'.

Data available from the unit record files of the *Labour Mobility Survey* on category of employment do not allow us to make this restriction according to type of employment for all the survey years. Moreover, in defence of the approach of including all types of workers it can be argued that there are many other types of workers who can experience involuntary job loss in the same manner as wage and salary earners. For example, VandenHeuvel and Wooden (1995) review evidence on self-employed contractors in Australia. They estimate that in 1994 7.5 per cent of the non-farm workforce were in this category. Of these self-employed contractors, about 40 per cent are found to be 'dependent' in the sense that they mainly provide services to one organisation. For example, a self-employed plumber may work solely for a single

building company on a contract basis. For such workers it seems reasonable to think of displacement occurring in the same way as for a wage and salary earner.[5]

Descriptive time-series information for the sample of workers in this study is presented in Figures 1 and 2. Figure 1 presents time-series information on the incidence of worker displacement, aggregate job loss (displacement plus other categories of job loss), and overall job mobility. Each series is expressed as a proportion of the total number of persons who held a job during the preceding twelve months. Across the sample period the rate of worker displacement averages about 3 per cent per annum, the aggregate rate of job loss is about 4.5 per cent per annum, and the aggregate rate of job mobility is about 14.5 per cent per annum. Figure 2 presents information on the probability of involuntary job loss for males and females, and on the aggregate rate of employment growth. The main feature that is evident is the strong counter-cyclical pattern in the rate of worker displacement.[6]

Summary information on rates of involuntary job loss for disaggregated workforce groups is presented in Table 2. The incidence of displacement appears to follow a U-shaped pattern with age for males; for females the incidence is relatively high for younger workers but similar for other age groups. For both males and females the incidence of displacement is much lower for workers with a university degree than with lower levels of education attainment; is generally higher for blue collar workers (such as labourers) than for white collar workers (such as managers); and higher for workers with jobs in manufacturing, construction and wholesale/retail trade than for workers in other industry groups.

IV. Incidence of retrenchment

In this section the results from regression analysis of the determinants of worker displacement are presented. Regression equations are estimated separately for male and female workers using pooled data from the set of *Labour Mobility Surveys*. Some sensitivity analysis to test the robustness the main findings is also undertaken.

The model for the determinants of worker displacement that is estimated can be summarised as:

$$D_{it} = \boldsymbol{b}X_i + \boldsymbol{j}\,CYCLE_t + \boldsymbol{q}F(1984,...,1996) + \boldsymbol{e}_{it} \qquad (1)$$

where D_{it} is an indicator for whether the ith worker in the year t sample is displaced; X_i is a set of demographic and skill/job characteristics of the ith worker, $CYCLE_t$ is a set of business cycle indicators, and F(1984,...,1996) represents a function of year effects.

A range of demographic and skill/job characteristics are included as explanatory variables. Demographic variables are dummy variables for age (5 categories), dummy variables for family status (4 categories), a dummy variable for marital status, a dummy variable for whether living in a capital city (state-level), dummy variables for state of residence (7 categories), and dummy variables for country of origin (3 categories that distinguish between Australian-born and immigrants from English-speaking and non-English speaking backgrounds). Job/skill characteristic variables are educational attainment (4 categories), a dummy variable for part-time/full-time status, industry status (12 categories), and occupation status (8 categories). Each of the job status variables is defined from the last job for a worker who is job mobile during the sample period, and from the current job for a worker who is not job mobile in the sample period. Perhaps the main omission from this set of variables is information on job tenure. Unfortunately, as has been noted above, the only data on job tenure that was available from the unit-record files of the *Labour Mobility Survey* was on whether a worker had been in a job for less than or more than one year – and that data has already been used to restrict the sample.

The descriptive overview of time-series movements in worker displacement has shown that there is a strong cyclical pattern in that series. In order to study whether there has been any upward trend in displacement it therefore appears necessary to correct for changes in worker displacement that reflect business cycle fluctuations. That is, our objective is to study whether there has been any change in the incidence

of worker displacement at some hypothetical reference state of average economic activity. [7]

Two business cycle indicators are used as explanatory variables for worker displacement. First, the vacancy rate in each year disaggregated by state; and second, the rate of employment growth in each twelve month sample period disaggregated by industry and state. (Hence, the vacancy rate variable is identified from year effects by inter-state variation, and the employment growth variable is identified from year effects by inter-industry and inter-state variation.)

One issue in making a choice of business cycle indicators is whether to use measures of output growth or labour market activity. Our choice has been to use labour market measures. Displacement represents a way for organisations to adjust their workforces in response to changes in labour demand. It therefore seems reasonable to interpret changes in labour demand as the fundamental demand-side force underlying changes in worker displacement. By contrast, the relation between output growth and worker displacement will depend both on the way that displacement responds to labour demand, and on the relation between labour demand and output growth.

Another issue is what measures of labour market activity to choose to represent the business cycle effects. As worker displacement is a demand-side phenomenon initiated by organisations that employ labour therefore cyclical indicators that primarily represent cyclical fluctuations in labour demand – employment growth and the vacancy rate – have been chosen. Other studies of the determinants of worker retrenchment have tended to use the rate of unemployment as a business cycle control. A problem with this variable is that it may confound cyclical fluctuations in labour demand and labour supply, and hence be less directly related to displacement than demand-side measures of labour market activity. Nevertheless, the robustness of the main findings to the use of this alternative business cycle indicator is considered.

Whether there has been a change in the incidence of worker displacement across time (for example, between the 1980s and 1990s) is investigated using two main

approaches. One (and the more flexible) approach is to include a full set of year dummy variables. The second approach is to include a time trend variable.

The model for the determinants of worker displacement is estimated as a probit model. The main results are presented in Table 3. Columns (1) and (4) report results from models for males and females with full sets of year dummy variables. Columns (2) and (5) report findings using a time trend variable to represent year effects. And columns (4) and (6) report findings from specifications with restricted sets of year dummy variables. These specifications are arrived at by 'testing down' to the most restricted specification that cannot be rejected against the specification with full set of year dummy variables. Results are reported as marginal effects – that is, the effect on the probability of displacement of changing the value of a dummy variable from zero to one.[8]

A range of demographic and job/skill characteristics are found to affect worker displacement. These findings are relatively robust across the alternative specifications. For males, workers without high school completion, aged 20-24 years or 55-64 years, and who were immigrants, are found to have relatively high probabilities of displacement. Occupation and industry status have some effect on the probability of displacement – managers and professionals have relatively low rates of displacement whereas labourers have relatively high rates. Workers in industries with predominantly public sector employment (such as government/defence, communications and EGW) and in the finance industry are found to have relatively low rates of retrenchment.

For females the relation between the explanatory variables and the incidence of displacement seems a little weaker. Workers without high school completion or with a post-secondary qualification have relatively high rates of displacement. However, age is not related to displacement, and only for immigrants from English-speaking background countries is there a positive effect on displacement. Female workers who are labourers and plant and machine operators are found to have a relatively high incidence of displacement, and workers in industries with predominantly public sector employment (such as government/defence, communications and EGW) and in the

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finance industry are found to have relatively low rates of retrenchment. Other types of explanatory variables – for family and marital status, region of residence, and hours of work – are generally found not to affect the incidence of displacement.

The business cycle variables have the predicted counter-cyclical relation with worker displacement. For both males and females a one percentage point increase in the rate of employment growth or in the vacancy rate would lower the probability of worker displacement by about two percentage points. The rate of employment growth is not significantly related (5% level) to the probability of displacement for females for the specifications with year dummy variables, but for all other specifications a significant relation exists between the business cycle variable and the probability of displacement. Consistent with much of the US literature, in the specification with a time trend the trend term is significant and positive for men, indicating an increasing incidence of retrenchment that is separate from business cycle changes. However, a Wald test rejects this specification against the specification with the full set of year dummy variables. The alternative specifications with restricted set of dummy variables are not however rejected against the specification with full set of dummy variables (by design).

Significant year effects are found for both males and females. For both groups the incidence of displacement (after controlling for changes in macroeconomic conditions) was stable throughout the 1980s, increased significantly at the start of the 1990s, and thereafter has moved back towards the level that existed in the 1980s. For males the effect remains significant in 1996, but for females no significant effect exists. Looking at the specifications with restricted year effects, the probability of displacement for males was about 1.1 percentage points higher in 1991/1992/1994 than in the 1980s but in 1996 was only about 0.5 percentage point greater. For females the probability of displacement was 0.7 percentage point higher in 1991 than in the 1980s, about 0.5 percentage point higher in 1992/1994, and was not significantly different from the 1980s in 1996. The magnitude of these year effects must be considered very large taking into account that the average rate of worker displacement is only about 3 per cent. It also seems important to note that the increase in the probability of displacement extends across periods of contraction

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(1990-91) and expansion (1992 onwards), and hence, it is unlikely that it can be explained by mis-measurement of the business cycle.

To investigate the robustness of the estimated year effects, a range of further models are considered. The results from this exercise are presented in Table 4. In column (1) the rate of unemployment (disaggregated by gender and state) is introduced as an explanatory variable. In column (2) the relevant gender-specific rate of employment growth (disaggregated by state by industry) is substituted for the rate of employment growth for persons. This variable would be more appropriate where there is gender segmentation of employment in the labour market. In column (3) square terms of the vacancy rate and rate of employment growth variables are included, as well as interactions of the rate of employment growth variables with a dummy variable for where the rate of employment growth is negative. This specification seeks to control for non-linearities in the relation between the incidence of displacement and the business cycle, and for the possibility that the relation between the rate of employment growth and displacement is asymmetric between positive and negative employment growth rates. In column (4) interactions between the year effects for the 1990s and the business cycle variables are included. The rationale is to control for changes in the cyclical relation between worker displacement and labour demand that may have occurred over the sample period. In the absence of the interaction variables, the effects of changes in the cyclical relation would be likely to be incorporated into the year effect variables. Of course, it might be argued that any such changes should properly be interpreted as a type of structural change in the labour market, and hence, should not be classified as purely business cycle effects.

The main message from Table 4 appears to be that the estimated year effects are robust to changes in the model specification.[9] For both males and females, including a rate of unemployment variable, or substituting the gender-specific rate of employment growth for the person-level employment growth variable, has little impact on the year effects.

In specifications with square terms and allowing for asymmetric effects of positive/negative employment growth the same year effects are significant. However,

for males the magnitude of those effects is altered somewhat, with the 1992 effect being reduced, and the 1994 and 1996 effects becoming larger. The magnitude of the effects for females though does not change appreciably. Interestingly, these specifications do seem to suggest that the relation between the incidence of displacement and the business cycle may be non-linear, and that there are asymmetric effects of positive/negative employment growth. To investigate this issue further, predictions of the probability of retrenchment for alternative assumptions on the rate of employment growth were calculated. These probabilities are presented in Table A2. It appears that the relation between employment growth and the incidence of displacement is not highly non-linear, but that displacement is more responsive to negative than to positive employment growth.[10] The relation between incidence of displacement and the vacancy rate does show evidence of non-linear effects, with increases in the vacancy rate associated with lower displacement, but smaller effects at higher levels of the vacancy rate.

Including interaction terms between the business cycle and year effects is found to alter the pattern and significance of the year effects somewhat. For males the largest year effect is now in 1992, and the effect for 1996 is not significant. For females, the largest year effect occurs in 1994, and the 1991 effect is not significant. Nevertheless, these results still demonstrate a significant increase in the incidence of displacement in the first half of the 1990s.[11] As noted above, it might also be argued that the interaction effects should be incorporated into any measure of structural change in the rate of worker displacement. For males many of the interaction effects are significant, and their sign indicates a stronger relation between the business cycle variables and the incidence of displacement in the 1990s than 1980s; however, for females none of the interaction effects is significant.

In summary, analysis of worker displacement in Australia between 1984 and 1996 finds that the incidence of displacement was significantly higher in the 1990s than 1980s. Both males and females experienced very large increases in the probability of retrenchment (about one-third of the average rate of displacement) in the early 1990s. Thereafter those effects have declined in magnitude. These findings appear to be robust to a range of alternative assumptions on the appropriate way to measure

business cycle effects, and the correct functional relation between the incidence of displacement and business cycle fluctuations in labour demand. [12]

V. Why is worker displacement higher in the 1990s?

In this section possible explanations for the increase in the incidence of worker displacement in Australia in the early to mid-1990s are investigated. In the first main part of the section, a simple conceptual framework for thinking about possible causes of changes in displacement is presented. Then, in the second main part, some empirical analysis using this framework is undertaken.

a. Conceptual framework

Retrenchment or displacement of workers is one way for an organisation to adjust its existing workforce. Where the existing workforce does not match with the workforce that is optimal, the organisation is likely to seek to adjust towards its optimum. Such adjustment may involve a change in total labour demand, or in the composition of labour demand (for example, shifts in the share of labour demand for workers in different occupation categories). Organisations can use changes in hours of work, hiring of new workers, or displacement of old workers, to achieve the adjustment.

To understand the possible causes of changes in displacement it is useful to express the decomposition of the possible methods of adjustment to labour demand more formally. Let total labour demand at an organisation be represented as:

$$LD_t = \sum_{i=1}^{N} h_{it}, \qquad \text{where } h_{it} \in (0, \bar{h}) \qquad (2)$$

Here N is the total number of potential workers at the organisation, h_{it} is the hours of labour input of worker i at time t, and the hours of each worker are assumed to vary between zero and a maximum value $\bar{h}$. The change in labour demand between times t-1 and t is therefore:

$$\Delta LD_{t,t-1} = \sum_{i=1}^{N} \Delta h_{it,t-1} \qquad\qquad (3)$$

where $\Delta h_{it,t-1}$ is the change in hours for worker i between periods t-1 and t.

Sources of changes in labour inputs for individual workers can be classified into three categories – worker displacement, new hires, and changes in hours of work. First, where $\Delta h_{it,t-1} = -h_{it-1}$, a worker can be defined as having been displaced between time periods t-1 and t. Second, a worker for whom $\Delta h_{it,t-1} = h_{it}$ is defined as a new hire. And third, where $\Delta h_{it,t-1} \in [-h_{it-1}, h_{it}]$ then this represents a change in hours for a worker who is at the organisation in both time periods.

One final preliminary point is that a measure of total workforce adjustment can be defined as the sum of the absolute value of changes in hours for all potential workers:

$$ADJ_{t,t-1} = \sum_{i=1}^{N} \left| \Delta h_{it,t-1} \right| \qquad\qquad (4)$$

The measure of total workforce adjustment is akin to measures of structural change in employment.

Using the equations for changes in labour demand and workforce adjustment it is now possible to describe the decomposition of possible causes of changes in the rate of worker displacements. First, changes in the magnitude of period to period changes in total labour demand may necessitate changes in the number of displacements. Second, holding constant the size of change in total labour demand, changes in the number of displacements may occur where there is a change in the extent of workforce adjustment. (For example, where all workers work the same number of hours, say 30 per week, an increase of 30 hours per week in total labour demand could be accomplished by hiring 1 new worker and with no displacements, or by hiring 11 new workers and retrenching 10 workers. In the latter case there is a higher degree of workforce adjustment.) Third, holding constant the size of change in total labour demand, and the extent of workforce adjustment, changes in worker displacements

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can occur where an organisation varies the extent to which it uses each of the three possible adjustment mechanisms to achieve desired changes in labour demand. (For example, suppose an organisation wants to reduce total labour input by 30 hours per week. It could achieve this objective by reducing the weekly hours of each of 15 workers by 2 hours per week, or it could retrench 1 worker who had been working 30 hours per week. The latter case would represent a situation where a greater share of changes to labour demand is being accomplished through worker displacement.)

b. Analysis of possible causes

The conceptual framework identifies three potential sources of changes to the rate of worker displacement across time – changes in the rate of growth in labour demand; changes in the rate of workforce adjustment; and changes in relative usage of displacement as an adjustment mechanism. In the regression analysis of the incidence of displacement one explanatory variable was the rate of employment growth by industry/state. Hence, that analysis already controls for changes in the annual rate of employment growth at the industry/state level. This means that the significant year effects on the incidence of worker displacement in the 1990s found in the probit analysis could derive either from increases in the extent of workforce adjustment that occurs within 1-digit industry/state classifications, or from an increase in the usage of displacement as a mechanism for organisations to adjust their workforces.

To represent the type of changes in the extent of workforce adjustment described in the conceptual framework, it would be necessary to have data on changes in hours of work for each potential worker in the economy within each of the 1-digit industry by state groups. Unfortunately, such data are not available. The most disaggregated data that exist to test for the effect of changes in the extent of workforce adjustment is annual rates of employment growth for 3-digit industry by state groups. This data is used to construct a measure of the variance of employment growth within 1-digit industry by state groups. A higher variance of employment growth rates will be associated with a higher rate of workforce adjustment, and hence can proxy for the effects of workforce adjustment on worker displacement. The variance measure is therefore included as an explanatory variable in the model for worker displacement in order to test for the role of workforce adjustment in explaining increases in the

incidence of worker displacement in the 1990s. Changes to ABS industry classifications mean that it is not possible to match 3-digit data on employment from before and after August 1983 in a completely satisfactory manner. Hence in the analysis of workforce adjustment only data for 1987 onwards is included.

Results are reported in Table 5. Columns (1) and (3) show results from the basic probit model re-estimated excluding observations from 1984. Columns (2) and (4) report results from the same probit model estimated on the same sample period with the extra explanatory variable for the variance of employment growth between 3-digit industries within each 1-digit industry by state group. Estimates of year effects for males are robust to exclusion of data for 1984; for females the results appear found to be more sensitive with only the year effect for 1991 remaining individually significant. However, estimating the more parsimonious specification given in column 6 of Table 3 but after omitting the year 1984 gives virtually identical results to those reported in Table 3. (For example, the marginal effect on y9294 is found to be 0.0043 compared to 0.0045 in Table 3.) The variable measuring workforce adjustment is found to be insignificant for both males and females. Hence, it can be concluded that the year effects on worker displacement cannot be attributed to higher rates of workforce adjustment between 3-digit industry groups.

From this analysis it can be concluded that increases in the incidence of worker displacement have occurred due either to an increase in the rate of workforce adjustment within 3-digit industry groups, or an increase in the relative importance of worker displacement as a mechanism for organisations to adjust their workforces. With existing data it is not possible to do more to distinguish between these hypotheses.

One further avenue of inquiry that is however open is to examine the nature of year effects on the incidence of worker displacement for disaggregated workforce groups. To undertake this analysis the basic Probit model with full set of year dummy variables is re-estimated for workforce groups disaggregated by age, education attainment, industry, occupation, and hours of work.

Estimates of year effects from this analysis are reported in Table 6. The main finding is that for both males and females the rise in displacement in the 1990s has not been uniform, but instead has varied in magnitude across different workforce groups. Significant individual year effects for males are found to be most prevalent for workers who have not completed high school, who are working in blue-collar (labourers and plant and machine operators) or low-skill white collar (clerks) occupations, and who are working in the construction, trade, education/health and finance industries. All male workers aged 25-64 years appear to have been similarly affected by the rise in the incidence of displacement. For female workers significant year effects are also found mainly for workers with low levels of education attainment. There are not particularly strong individual year effects within disaggregated occupation groups, but as for males, some evidence that effects have been strongest for blue collar and low-skill white collar occupations is present. The rise in the incidence of worker displacement for females appears to be most prominent within manufacturing, construction, finance, and transport/storage industries, and also within the group of workers aged 45-54 years.

The particular pattern that emerges from analysis of the incidence of worker displacement for disaggregated workforce groups is that it was primarily workers with low education attainment working in low-skill occupations who experienced increases in displacement in the 1990s. Significantly, this is also the group of workers who are observed to have the highest average rates of displacement over the sample period. Hence, the rise in worker displacement in Australia in the 1990s does not seem to have been associated with the same type of 'democratisation' of displacement as has occurred in the United States (see for example Aaranson and Sullivan, 1998).

VI. Conclusion

This study has examined the incidence of displacement for individual workers in Australia between 1984 and 1996. Particular features have been a detailed empirical analysis of time-series changes in the incidence of displacement, and the application of a simple conceptual framework for understanding the causes of those changes.

Time-series effects on the incidence of displacement are observed. First, using a variety of business cycle controls, it is found that displacement follows a counter-cyclical pattern. Second, after controlling for cyclical effects, some structural change in the incidence of displacement is identified. Rates of worker displacement were significantly higher in the early 1990s than the 1980s; however, the magnitude and significance of this structural effect became less from the early to mid 1990s. Further, capturing the structural change as a time trend is strongly rejected in favour of a more flexible specification of the period effects.

Analysis for disaggregated workforce groups shows that the rise in the incidence of worker displacement was more concentrated amongst workers with low levels of educational attainment, and in blue-collar or low-skill white-collar occupations. It seems that the main potential explanations for the higher rate of displacement are either an increase in the magnitude of intra-industry workforce adjustment, or a rise in the extent to which organisations used displacement as a method for adjusting their workforces.

The findings from the study suggest some general lessons for work on the incidence of displacement in the labour market. First, it seems that to obtain a proper perspective on time-series changes in worker displacement, it is necessary to allow for separate effects between fairly narrowly defined time periods (such as year to year variation). Second, it may be useful to explore the causes of time-series changes in worker displacement using a conceptual framework that distinguishes between changes in the rate of employment growth, the rate of workforce adjustment, and the extent to which organisations use displacement as an adjustment mechanism.

Endnotes

1.   In the paper we refer to each survey by the year in which it was undertaken. In each case this means that the data refer to experiences of survey respondents in the twelve months preceding February in that year.

2. The average number of workers retrenched in each year is 359,100. Of this amount 269,500 are retrenchments due to 'no work, and 89,600 are due to 'other reasons'. The variance decomposition analysis uses the condition that:

$$VAR(R_t) = VAR(RNW_t) + VAR(RO)_t + 2COV(RNW_t, RO_t)$$

where R_t, RNW_t, and RO_t denote respectively the total retrenchments, retrenchments due to no work, and retrenchments for other reasons, in year t. Further details are available on request from the authors.

3.   Data from the ABS *Labour Mobility Survey* for February 1989 (Table 6) show that out of a total of 9,888,000 jobs held during the preceding twelve months 1,612,000 were jobs held by multiple job holders. Data from the ABS *Retrenchment and Redundancy Survey 1997* (catalogue no.6266.0) show that 15 per cent of displaced workers had more than one episode of retrenchment in the previous three years. Hence, there would probably be less than 15 per cent of displaced workers with multiple retrenchment episodes in the previous twelve months.

4.   One year of job tenure is chosen as the criteria for sample restriction as the job tenure variable that is available from the unit-record files of the *Labour Mobility Survey* only identifies whether a worker had less than or more than one year of tenure.

5. For the *Labour Mobility Surveys* undertaken in 1984 and 1991 information is available on workers disaggregated by type of employment. For males, in 1984, 2.5 per cent and 3.7 per cent respectively of self-employed workers and wage and salary earners were retrenched; and in 1991, the comparable figures are 3.4 per cent and 4.7 per cent.

6. The period covered by the first sample period in the twelve months preceding 1984 was at the end of a recession; the periods covered by the 1987 and 1989 samples are during an expansion; the periods covered by the 1991 and 1992 samples are during a recession; and the periods covered by the 1994 and 1996 samples are an expansion.

7. It might be argued that current debate over job security is primarily concerned with changes in 'gross job security' that reflect both cyclical and structural changes (for example, Gottschalk and Moffitt, 1999, p.S103). However, in considering adjustment costs in the economy due to worker displacement, and whether there is a need for extra government policy for displaced workers, separating between cyclical and structural components of time-series changes does seem important.

8.   Marginal effects are calculated holding other explanatory variables at their average values. We also experimented with calculating marginal effects for a range of base cases (where each dummy variable is assigned a (0,1) value) but this was found to have virtually no effect on the results.

9.   Some of these alternative specifications appear to be preferred to the basic specification reported in columns (1) and (4) of Table 3. For example, a Wald test of the (unrestricted) specification that includes the square terms for employment growth and the vacancy rate against the (restricted) specification that does not include those variables finds that the restricted specification can be rejected at the 1% level of significance. Our objective in this exercise is not however to find the most preferred model specification but simply to test the robustness of the estimated year effects.

10. This would appear to be consistent with evidence that the rate of job destruction is more sensitive to business cycle fluctuations than is the rate of job creation (for evidence for Australia see Borland, 1996).

11. With the omission of insignificant year/business cycle interaction variables the size and significance levels of the year effects become very close to reported values in Table 3 (Probit results that do not include interaction variables). For the sake of transparency we have chosen to report the results from the specifications that include the full set of interaction variables.

 12. A number of other sensitivity tests were conducted but are not reported here. For example, we allowed the impact of the business cycle variables on retrenchment to vary by industry and occupation, but the inclusion of these interaction terms had very little effect on the estimated year effects.

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Table 1: Classification of reason for ceasing last job – ABS Labour Mobility Survey

A. Job loser
  - Retrenched
  - Job was temporary or seasonal and did not leave to return to studies
  - Own ill health or injury
B. Job leaver
  - Ceased a job with employer/business
      - Unsatisfactory work conditions
      - Job was temporary or seasonal and left to return to studies
      - Retired, new business, better job, family or other reasons
  - Changed locality but not employer
      - Employment reasons
      - Personal reasons
      - Other reasons

Table 2: Average probability of retrenchment by disaggregated worker characteristics – Australia – 1984 to 1996

	Males	Females
Age		
20-24	0.058	0.032
25-34	0.037	0.026
35-44	0.031	0.025
45-54	0.031	0.025
55-64	0.040	0.027
Education		
Degree +	0.0178	0.013
Post-secondary qualification	0.0399	0.024
High School	0.0431	0.024
Less than High School	0.0347	0.033
Occupation of last job		
Manager	0.023	0.022
Professional	0.016	0.015
Para-professional	0.022	0.012
Tradesperson	0.052	0.034
Clerk	0.025	0.032
Salesperson	0.042	0.026
Plant and machine operators	0.039	0.052
Labourers	0.053	0.034
Industry of last job		
Manufacturing	0.048	0.046
Construction	0.070	0.033
Finance, property and business services	0.029	0.012
Government/Defence	0.010	0.012
Education/Health	0.012	0.030
Transport and storage	0.033	0.032
Wholesale and retail trade	0.045	0.034

Table 3: Determinants of probability of retrenchment – Probit - Marginal effects – Australia – 1984 to 1996

	Males			Females		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Year effects						
1987	0.0010 (0.002)			0.0013 (0.002)		
1989	-0.0004 (0.003)			-0.0004 (0.003)		
1991	0.0139* (0.002)			0.0072* (0.002)		0.0071* (0.001)
1992	0.0113* (0.002)			0.0057* (0.002)		
1994	0.0117* (0.002)			0.0037 (0.002)		
1996	0.0059* (0.002)		0.0055* (0.002)	-0.0014 (0.002)		
Trend		0.0008* (0.0001)			0.0001 (0.0001)	
1991/1992/1994			0.0112* (0.001)			
1992/1994						0.0045* (0.001)
Business cycle						
Rate of employment growth	-0.0229* (0.006)	-0.0303* (0.006)	-0.0246* (0.006)	-0.0137 (0.007)	-0.0185* (0.007)	-0.0141 (0.007)
Vacancy rate	-0.0216* (0.004)	-0.0288* (0.002)	-0.0197* (0.002)	-0.0126* (0.004)	-0.0174* (0.002)	-0.0133* (0.003)
Education						
Degree	-0.0025 (0.002)	-0.0026 (0.002)	-0.0025 (0.002)	-0.0023 (0.002)	-0.0025 (0.002)	-0.0024 (0.002)
Post-secondary qualifcn.	0.0036 ().001)	0.0037 (0.001)	0.0036 (0.001)	0.0061 (0.001)	0.0064* (0.002)	0.0063* (0.002)
Less than high school	0.0066* (0.002)	0.0067* (0.002)	0.0067* (0.002)	0.0079* (0.001)	0.0081* (0.001)	0.0081* (0.001)
Age						
20-24 years	0.0089* (0.002)	0.0089* (0.002)	0.0089* (0.002)	0.0022 (0.001)	0.0021 (0.001)	0.0022 (0.001)
35-44 years	-0.0029* (0.001)	-0.0030* (0.001)	-0.0030 (0.001)	-0.0172 (0.001)	-0.0017 (0.001)	-0.0017 (0.001)
45-54 years	-0.0027 (0.001)	-0.0029 (0.001)	-0.0027 (0.001)	-0.0014 (0.001)	-0.0016 (0.001)	-0.0015 (0.001)
55-64 years	0.0066* (0.002)	0.0063* (0.002)	0.0066* (0.002)	0.0018 (0.002)	0.0014 (0.002)	0.0017 (0.002)

Last occupation						
Manager	-0.0096*	-0.0096*	-0.0096*	-0.0022	-0.0020	-0.0021
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Professional	-0.0102*	-0.0101*	-0.0102*	-0.0009	-0.0005	-0.0008
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Para-professional	-0.0052	-0.0055	-0.0052	-0.0047	-0.0051	-0.0047
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Tradesperson	0.0035	0.0033	0.0035	-0.0008	-0.0010	-0.0007
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Plant and machine operators	0.0001	0.0000	0.0001	0.0087*	0.0088*	0.0088*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Clerk	-0.0054	-0.0054	-0.0053	-0.0003	-0.0003	-0.0003
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Labourer	0.0106*	0.0106*	0.0106*	0.0069*	0.0067*	0.0069*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Last industry						
Agriculture	-0.0213*	-0.0219*	-0.0214*	-0.0163*	-0.0167*	-0.0163*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mining	-0.0010	-0.0016	-0.0012	0.0110	0.0108	0.0111
	(0.003)	(0.003)	(0.003)	(0.009)	(0.009)	(0.009)
Manufacturing	0.0000	0.0000	0.0000	0.0006	0.0006	0.0006
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
EGW	-0.0103*	-0.0107*	-0.0104*	-0.0140*	-0.0143*	-0.0140*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Construction	0.0129*	-0.0085*	0.0129*	-0.0019	-0.0019	-0.0019
	(0.002)	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)
Government/Defence	-0.0243*	-0.0244*	-0.0243*	-0.0170*	-0.0170*	-0.0170*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Recreation and other services	-0.0068*	-0.0068*	-0.0068*	-0.0032	-0.0033	-0.0033
	(0.002)	(0.002)	(0.002)	(0.0018)	(0.001)	(0.001)
Communications	-0.0202*	-0.0203*	-0.0203*	-0.0069	-0.0069	-0.0069
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Finance, property and business services	-0.0068*	-0.0067*	-0.0068*	-0.0078*	-0.0078*	-0.0079*
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Education/Health	-0.0022*	-0.0224*	-0.0224*	-0.0202*	-0.0203*	-0.0202*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Transport and storage	-0.0085	-0.0085*	-0.0085*	-0.0071*	-0.0071*	-0.0071*
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Family status						
Couple with no dependents	-0.0031*	-0.0028	-0.0031*	-0.0018	-0.0015	-0.0018
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sole parent	0.0007	0.0006	0.0006	0.0016	0.0014	0.0013
	(0.007)	(0.007)	(0.007)	(0.005)	(0.001)	(0.005)
Other family status	0.0033	0.0035	0.0033	-0.0054	-0.0053	-0.0054
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Marital status						
Married	-0.0023	-0.0024	-0.0023	-0.0093	-0.0095	-0.0092
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)

State						
VIC	-0.0025 (0.001)	-0.0036* (0.001)	-0.0022 (0.001)	0.0022 (0.001)	0.0014 (0.001)	0.0021 (0.001)
QLD	-0.0026 (0.001)	-0.0043* (0.001)	-0.0022 (0.001)	-0.0015 (0.001)	-0.0026 (0.001)	-0.0017 (0.001)
SA	-0.0081 (0.001)	-0.0101* (0.001)	-0.0076* (0.001)	-0.0041 (0.002)	-0.0056* (0.001)	-0.0044* (0.001)
WA	-0.0021 (0.001)	-0.0030 (0.001)	-0.0018 (0.001)	-0.0008 (0.001)	-0.0015 (0.001)	-0.0010 (0.001)
TAS	-0.0062* (0.002)	-0.0083* (0.001)	-0.0058* (0.0021)	-0.0048 (0.002)	-0.0062* (0.002)	-0.0050* (0.002)
NT/ACT	0.0045 (0.004)	0.0069 (0.004)	0.0034 (0.003)	0.0033 (0.004)	0.0050 (0.003)	0.0036 (0.003)
Region						
Capital city	-0.0002 (0.001)	-0.0017 (0.001)	-0.0004 (0.001)	-0.0006 (0.001)	-0.0018 (0.001)	-0.0006 (0.001)
Country of birth						
NESB	0.0049* (0.001)	0.0055* (0.001)	0.0050* (0.001)	0.0013 (0.001)	0.0018 (0.001)	0.0014 (0.001)
ESB	0.0045* (0.001)	0.0048* (0.001)	0.0046* (0.001)	0.0038* (0.001)	0.0040* (0.001)	0.0038* (0.001)
Hours in last job						
Part-time	0.0033 (0.002)	0.0032 (0.002)	0.0032 (0.002)	-0.0016 (0.001)	-0.0015 (0.001)	-0.0016 (0.001)
Sample size	103,813	103,813	103,813	73,831	73,831	73,831
Pseudo R-squared	0.050	0.049	0.050	0.039	0.038	0.039
Log likelihood	-15748.0	-15766.4	-15748.7	-87360.7	-8747.4	-8738.0
Wald test against specification with full set of year dummy variables – p value		0.000	0.845		0.000	0.695

Notes: a) Standard errors in parentheses. Asterisk denotes significant at the 5% level; and b) Omitted variables are 20-24 years, High school; Wholesale and retail trade; Salesperson; NSW; Couple with dependents; and Australian born.

**Table 4: Year effects on probability of retrenchment – Sensitivity analysis –
Probit marginal effects – Australia – 1984 to 1996**

A. Males

	(1)	**(2)**	**(3)**	**(4)**
Year effects				
1987	0.0017	0.0008	0.0044	0.0000
	(0.0028)	(0.002)	(0.003)	(0.000)
1989	0.0011	-0.0008	0.0026	-0.0022
	(0.003)	(0.003)	(0.003)	(0.003)
1991	0.0169*	0.0137*	0.0170*	0.0152*
	(0.003)	(0.002)	(0.003)	(0.007)
1992	0.0115*	0.0108*	0.0079*	0.0290*
	(0.002)	(0.002)	(0.002)	(0.008)
1994	0.0087*	0.0113*	0.0153*	0.0405*
	(0.002)	(0.002)	(0.002)	(0.014)
1996	0.0056*	0.0058*	0.0099*	0.0018
	(0.002)	(0.002)	(0.003)	(0.007)
Business cycle				
Rate of employment Growth	-0.0227* (0.006)		-0.0307* (0.015)	-0.0094 (0.006)
Vacancy rate	-0.0159* (0.005)	-0.0220* (0.004)	-0.0745* (0.011)	-0.0189* (0.005)
Rate of unemployment	0.0014* (0.000)			
Vacancy rate squared			0.0292* (0.005)	
(Rate of employment growth)* (Employment growth < 0)			-0.0476 (0.035)	
Rate of employment growth squared			0.0291* (0.014)	
(Rate of employment growth squared)* (Employment growth < 0)			-0.2603* (0.097)	
Rate of employment growth - Males		-0.0215* (0.005)		

	(1)	(2)	(3)	(4)
Interaction effects				
1991*Rate of employment growth				-0.0467* (0.019)
1992*Rate of employment growth				-0.0548* (0.021)
1994*Rate of employment growth				0.0080 (0.021)
1996*Rate of employment growth				-0.0953* (0.032)
1991*Vacancy rate				-0.0032 (0.007)
1992*Vacancy rate				-0.0303* (0.011)
1994*Vacancy rate				-0.0316* (0.012)
1996*Vacancy rate				0.0038 (0.008)
Pseudo R-squared	0.051	0.050		0.051
Log likelihood	-15745.5	-15747.6	15733.4	-15732.0

B. Females

	(1)	(2)	(3)	(4)
Year effects				
1987	0.0023 (0.003)	0.0009 (0.002)	0.0025 (0.003)	-0.0001 (0.003)
1989	0.0016 (0.004)	-0.0007 (0.003)	0.0004 (0.003)	-0.0022 (0.003)
1991	0.0120* (0.004)	0.0069* (0.002)	0.0084* (0.003)	0.0114 (0.007)
1992	0.0082* (0.002)	0.0055* (0.002)	0.0046* (0.002)	0.0142* (0.007)
1994	0.0038 (0.002)	0.0034 (0.002)	0.0048* (0.002)	0.0198* (0.012)
1996	0.0012 (0.003)	-0.0017 (0.002)	0.0002 (0.002)	0.0147 (0.009)
Business cycle				
Rate of employment Growth	-0.0133 (0.007)		0.0119 (0.018)	-0.0167 (0.008)
Vacancy rate	-0.0082	-0.0123*	-0.0346*	-0.0089

	(0.004)	(0.004)	(0.012)	(0.005)
Rate of unemployment	0.0017 (0.009)			
Vacancy rate squared			0.0122* (0.005)	
(Rate of employment growth)* (Employment growth < 0)			-0.1118* (0.050)	
Rate of employment growth squared			0.0475 (0.030)	
(Rate of employment growth squared)* (Employment growth < 0)			-05347* (0.232)	
Rate of employment growth – Females		-0.0106 (0.008)		
Interaction effects				
1991*Rate of employment growth				0.0141 (0.022)
1992*Rate of employment growth				-0.0085 (0.028)
1994*Rate of employment growth				0.0089 (0.027)
1996*Rate of employment growth				0.0142 (0.034)
1991*Vacancy rate				-0.0051 (0.007)
1992*Vacancy rate				-0.0146 (0.010)
1994*Vacancy rate				-0.0202 (0.012)
1996*Vacancy rate				-0.0172 (0.008)
Pseudo R-squared	0.039	0.039	0.039	0.039
Log likelihood	-8735.0	-8737.1	-8731.1	-8734.2

Notes: a) Standard errors in parentheses. Asterisk denotes significant at the 5% level; and b) Omitted variables are 20-24 years, High school; Wholesale and retail trade; Salesperson; NSW; Couple with dependents; and Australian born.

Table 5: Year effects on probability of retrenchment – Effect of variance in employment growth – Probit marginal effects – Australia – 1987 to 1996

	Male		Female	
	(1)	**(2)**	**(3)**	**(4)**
Year effects				
1989	-0.0009	-0.0009	-0.0017	-0.0017
	(0.002)	(0.002)	(0.002)	(0.002)
1991	0.0114*	0.0114*	0.0054*	0.0054*
	(0.002)	(0.002)	(0.002)	(0.002)
1992	0.0114*	0.0114*	0.0043	0.0043
	(0.003)	(0.003)	(0.003)	(0.003)
1994	0.0125*	0.0125*	0.0024	0.0023
	(0.003)	(0.003)	(0.002)	(0.002)
1996	0.0046*	0.0046*	-0.0027	-0.0027
	(0.002)	(0.002)	(0.002)	(0.002)
Business cycle				
Rate of employment Growth	-0.0532*	-0.0534*	-0.0146	-0.0152
	(0.009)	(0.009)	(0.011)	(0.011)
Vacancy rate	-0.0176*	-0.0176*	-0.0121*	-0.0121*
	(0.004)	(0.004)	(0.004)	(0.004)
Variance of employment growth rate		0.0002		0.0005
		(0.0004)		(0.0004)
Pseudo R-squared	0.051	0.051	0.042	0.042
Log likelihood	-1385.2	-1385.1	-765.9	-765.7
Number of observations	88,439	88,439	64,717	64,717

Notes: a) Standard errors in parentheses. Asterisk denotes significant at the 5% level; and b) Omitted variables are 20-24 years, High school; Wholesale and retail trade; Salesperson; NSW; Couple with dependents; and Australian born.

Table 6: Year effects on probability of retrenchment – Disaggregated workforce groups by gender – Probit marginal effects – Australia – 1984 to 1996

A. Males	1987	1989	1991	1992	1994	1996
Education						
Degree	0.0022	-0.0025	-0.0001	0.0049	0.0133*	0.0053
Post-secondary qualifcn.	-0.0045	-0.0032	0.0138*	0.0092*	0.0124*	0.0047
High school	-0.0019	0.0002	0.0102	0.0155*	0.0046	-0.0062
Less than high school	0.0093	0.0049	0.0221*	0.0146*	0.0117*	0.0172*
Age						
20-24	-0.0034	-0.0001	0.0196*	0.0000	0.0033	-0.0087
25-34	0.0022	-0.0045	0.0190*	0.0127*	0.0097*	0.0054
35-44	0.0035	0.0027	0.0119*	0.0130*	0.0141*	0.0085
45-54	0.0023	0.0014	0.0118*	0.0095*	0.0124*	0.0102
55-64	-0.0012	0.0040	0.0070*	0.0205*	0.0176*	0.0079
Last occupation						
Manager	-0.0026	-0.0052	-0.0003	0.0101*	-0.0016	-0.0032
Professional	0.0007	-0.0070	0.0038	0.0111	0.0116	0.0032
Para-professional	0.0049	0.0016	0.0063	0.0039	0.0108*	0.0126
Salesperson	0.0028	0.0089	0.0181	0.0173	0.0130	0.0022
Tradesperson	-0.0045	-0.0097	0.0152*	0.0060	0.0085	0.0028
Plant and machine operators	0.0218*	0.0134	0.0342*	0.0088	0.0208*	0.0151
Clerk	0.0018	0.0165	0.0162*	0.0177*	0.0281*	0.0230*
Labourer	0.0123	0.0246	0.0420*	0.0388*	0.0369*	0.0259*
Last industry						
Manufacturing	0.0136	-0.0006	0.0343*	0.0110	0.0067	0.0101
Construction	0.0097	-0.0109	0.0547*	0.0241*	0.0136	0.0286*
Government/Defence						
Finance, property and business services	0.0101	0.0078	0.0138	0.0312*	0.0223*	0.0108
Education/Health	-0.0032	-0.0021	-0.0029	0.0087*	0.0144*	0.0034
Transport and storage	-0.0092	-0.0168	-0.0063	0.0177*	0.0136	-0.0006
Wholesale and retail trade	0.0146	0.0137	0.0162*	0.0139*	0.0052	0.0039

B. Females	1987	1989	1991	1992	1994	1996
Education						
Degree	-0.0075	-0.0058	-0.0043	-0.0006	-0.0011	-0.0059
Post-secondary qualifcn.	0.0052	0.0068	0.0033	0.0076*	0.0027	-0.0035
High school	-0.0047	-0.0119	0.0053	0.0014	0.0049	-0.0009
Less than high school	0.0032	-0.0004	0.0160*	0.0078*	0.0040	0.0010
Age						
20-24	0.0173	0.0057	0.0174*	0.0088	0.0117	0.0074
25-34	-0.0038	-0.0074	0.0032	0.0067	0.0007	-0.0049
35-44	-0.0066	-0.0046	-0.0000	-0.0024	-0.0016	-0.0085*
45-54	0.0090	0.0114	0.0167*	0.0108*	0.0093	0.0046
55-64	0.0079	0.0068	0.0088	0.0144	0.0050	0.0097
Last occupation						
Manager	-0.0018	-0.0160*	-0.0051	-0.0063	-0.0085	-0.0063
Professional	-0.0028	-0.0052	0.0014	0.0006	-0.0020	-0.0066
Para-professional	-0.0025	-0.0039	-0.0015	-0.0019	-0.0006	-0.0065
Salesperson	0.0057	0.0057	0.0117	0.0022	0.0042	0.0011
Tradesperson	0.0044	0.0006	0.0241	0.0299*	0.0070	-0.0044
Plant and machine operators	-0.0052	0.0433	0.0446	0.0355	0.0379	-0.0133
Clerk	0.0029	0.0037	0.0096*	0.0056	0.0048	0.0024
Labourer	0.0032	-0.0030	0.0069	0.0220*	0.0131	0.0021
Last industry						
Manufacturing	0.0056	0.0246	0.0363*	0.0351*	0.0088	0.0069
Construction	0.0334	0.0012	0.0405	0.0361*	0.0197	0.0598*
Government/Defence	0.0080	0.0167	0.0017	-0.0068	0.0025	-0.0013
Finance, property and business services	0.0114	0.0114	0.0256*	0.0151*	0.0112	0.0062
Education/Health	-0.0053	-0.0041	-0.0044	-0.0043	-0.0030	-0.0049
Transport and storage	0.0221	0.0179	0.0520*	0.0464*	0.0639*	0.0071
Wholesale and retail trade	0.0010	-0.0048	0.0142	0.0125	0.0018	-0.0086

Notes: a) Asterisk denotes significant at the 5% level; and b) Omitted variables are 20-24 years, High school; Wholesale and retail trade; Salesperson; NSW; Couple with dependents; and Australian born.

Appendix Table A1: Sample descriptive statistics

Panel 1: Sample Selection

	Men	Women
Aged 65+	0.003	0.002
Job Duration < 1 year	0.152	0.218
Aged 15-19	0.077	0.101
Sample Size	129740	100481

Panel 2: Sample means of explanatory variables
(estimation sample: 103813 observations for men; 73831 observations for women)

Education	Men	Women		Age	Men	Women
University Degree	0.132	0.124		Aged 20-24	0.113	0.147
Other Post-sec	0.414	0.343		Aged 25-34	0.277	0.282
High School Only	0.120	0.136		Aged 35-44	0.278	0.291
Less than HS	0.334	0.397		Aged 45-54	0.205	0.199
				Aged 55-64	0.126	0.081
Industry	**Men**	**Women**		**Occupation**	**Men**	**Women**
Agriculture	0.064	0.042		Manager/Admin	0.150	0.071
Mining	0.021	0.003		Professional	0.129	0.130
Manufacturing	0.197	0.107		Para-professional	0.066	0.082
Electricity/Gas	0.026	0.005		Tradesperson	0.238	0.037
Construction	0.107	0.025		Plant/Machine Oper.	0.117	0.031
Transport/Storage	0.074	0.025		Clerk	0.072	0.337
Communications	0.024	0.015		Laborer	0.150	0.132
Education/Health	0.108	0.309		Salesperson	0.077	0.181
Government	0.054	0.047				
Recreation Services	0.052	0.095		**State**	**Men**	**Women**
Finance/Property	0.098	0.133		New South Wales	0.342	0.339
Wholesale/Retail	0.175	0.193		Victoria	0.263	0.267
				Queensland	0.164	0.161
Family/Marital	**Men**	**Women**		South Australia	0.084	0.086
Couple w/ Children	0.427	0.367		Western Australia	0.095	0.093
Couple w/o Children	0.282	0.306		Tasmania	0.026	0.025
Sole Parent	0.007	0.041		NT/ACT	0.026	0.028
Other Family Status	0.284	0.286				
Married	0.724	0.694		**Region of Origin**	**Men**	**Women**
				Born in Australia	0.722	0.745
Size of Location	**Men**	**Women**		English Speaking	0.122	0.121
Capital City	0.571	0.589		Other Regions	0.156	0.134
Hours of work	**Men**	**Women**		**Macro Controls**	**Men**	**Women**
Less than 30hrs/wk	0.050	0.365		Vacancy Rate	0.784	0.781
				Empl. Growth Rate	0.014	0.020

Appendix Table A2: The relation between business cycle variables and the incidence of displacement

Predicted probability of displacement:

	Males	**Females**
Rate of employment growth:		
-0.03	0.0461	0.0495
-0.02	0.0452	0.0482
-0.01	0.0442	0.0467
0	0.0432	0.0450
0.01	0.0428	0.0452
0.02	0.0424	0.0453
0.03	0.0420	0.0455
Vacancy rate:		
0	0.1002	0.0763
0.4	0.0500	0.0493
0.8	0.0305	0.0359
1.2	0.0245	0.0303

Note: Predictions of probability of displacement are derived from specifications in column (3) of panels A and B in Table 4. For predictions for different rates of employment growth the vacancy rate is set at its average value; and predictions for different vacancy rates set the rate of employment growth at its average value. The year effect is set at 1984. All other variables are set at sample average values.
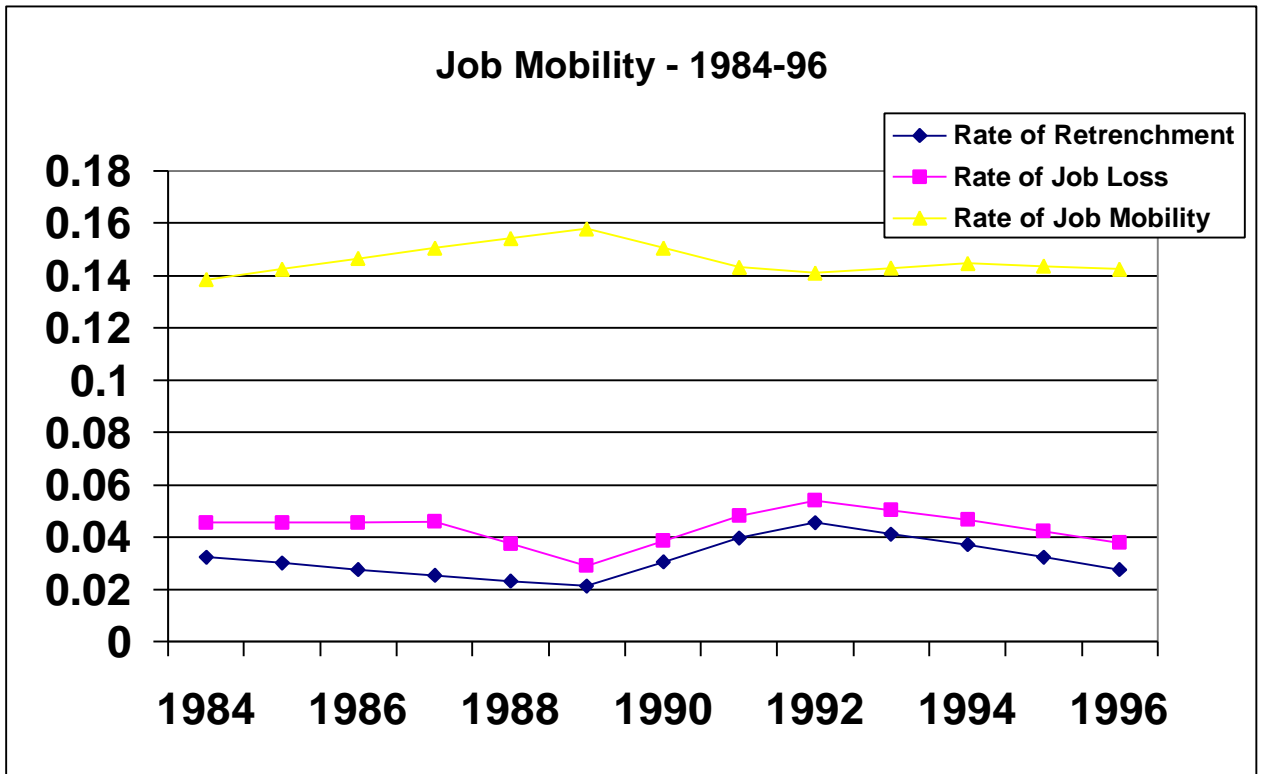
Figure 1

Job Mobility - 1984-96

Figure 2

Displaced workers - 1984-96