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**DISPLACED WORKERS IN
AUSTRALIA 1984-1996:
MACROECONOMIC CONDITIONS
AND STRUCTURAL CHANGE**

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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. The findings provide an interesting cross-country perspective to recent findings on the evolution of worker displacement in the United States.

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I. Introduction

During the 1990s and through to the present in most industrialised countries there has been considerable interest in the phenomenon of job insecurity – the likelihood of workers experiencing involuntary job loss. In a large part this interest appears to have been motivated by a belief 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 industrialised economies (such as government sector reform, and increased usage of temporary help and contract workers) that 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, Aaronson 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 study seeks to make two main contributions to the literature on job security and displaced workers. First, the analysis of time-series patterns in worker displacement using individual-level data from a general population survey represents a significant addition to understanding of worker displacement in Australia, and hence to cross-country perspectives on trends in displacement. Second, and of general relevance to the international literature on job security, through the detailed investigation of time-series

changes in worker displacement that is undertaken, the paper makes a simple, but nevertheless important point about methodology. 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.¹ This study provides a more detailed analysis of the nature of structural change in worker displacement, and analyses the effect of alternative approaches to controlling for cyclical effects.

The value of the empirical approach adopted in this study is evident in the new perspective that it provides into understanding time-series patterns in worker displacement. Our main conclusion is that some structural increase in the incidence of worker displacement did occur in Australia in the early 1990s, but that the increase appears to have disappeared by the mid-1990s. This raises the question of whether structural changes in the incidence of worker mobility that are perceived to have occurred in a range of other countries are a permanent or temporary phenomenon. Our analysis suggests that in order to answer this question 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, analysis for disaggregated workforce groups, and sensitivity analysis. Concluding remarks are in section V.

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 for subsequent employment and labour market earnings outcomes. For the most part this literature has involved analysis of North American labour markets (for reviews see Hamermesh, 1989; Fallick, 1996; and Kletzer, 1998).

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 (see for example, Farber, 1997, Aaronson and Sullivan, 1998, Monk and Pizer, 1998, Boisjoly et al., 1998, and Polsky, 1999). 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 was 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. 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. It is suggested that one explanation for the finding of an increase in involuntary job loss from earlier studies using the Displaced Worker Survey (DWS) is likely to be changes in the questions in that survey (see also Abraham, 1997). However, Farber (2001), from an analysis that uses the DWS between 1981 and 1999 and corrects for changes in the survey question format, still concludes that some secular increase in the rate of involuntary job loss occurred in the 1990s.²

The literature on involuntary job losses for other countries is not as extensive as for North America. (One major exception in the set of cross-country studies in Kuhn, 2001). 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 an 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 trend is evident in the period between the mid 1970s and late 1990s. Finally, no trend is apparent 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 roughly biennial supplementary survey to the monthly household *Labour Force Survey* - is used in this study to examine the incidence of worker displacement. The survey 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. Each survey is from a different population sample so that the data set consists of a series of cross-section surveys.

To undertake analysis of incidence of displacement it is necessary to define what will constitute a displaced worker, and the overall population of workers who are 'at risk' of being displaced. The definitions adopted in this study are determined by the sampling approach and the question format in the *Labour Mobility Survey*. Using the *Labour Mobility Survey* it is possible to identify from the sample of respondents who held a job at

some time during the twelve months preceding the survey those workers who ceased a job during the period, and for those workers who did cease a job to identify the reason for ceasing the last job held. Possible reasons for ceasing the last job held are having been 'retrenched', the job being temporary or seasonal, ill-health, or several categories of voluntary exit from a job.

The sample of displaced workers for this study 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 had 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 did not have missing information on the 'industry in last job' variable.

An important issue regarding the identification of displaced workers and the population of workers at risk of displacement 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. Analysis of other available data suggests that the available data under-state both total displacements and total jobs by no more than fifteen per cent.³ Hence it seems that the under-statement will have little effect on estimates of the aggregate rate of displacement. It is also worth noting that other studies of worker displacement face even more severe data limitations – for example, using the DWS it is necessary to define the population of

workers 'at risk' of being displaced in the previous three years as persons employed at the survey date (Farber, 1997).

Another issue concerning identification of displaced workers is that the category 'retrenched' incorporates several types of reasons for job loss – dismissal due to business closing; dismissal for reasons of insufficient labour demand that do 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 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. 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.

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, 2001). 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. 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 information on the incidence of worker displacement for the sample of workers in this study is presented in Figures 1 and 2, and in Table 1. 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 separations. 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 separation 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.

Summary information on rates of involuntary job loss for disaggregated workforce groups is presented in Table 1. 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*. Sensitivity analysis to test the robustness the main findings is also undertaken.

a. Methodology

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

$$D_{it} = \beta X_i + \phi CYCLE_t + \theta F(1984, \dots, 1996) + \varepsilon_{it} \quad (1)$$

where D_{it} is an indicator for whether the i th worker in the year t sample is displaced; X_i is a set of demographic and skill/job characteristics of the i th worker, $CYCLE_t$ is a set of business cycle indicators, and $F(1984, \dots, 1996)$ 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, family status, marital status, resident in a state capital city, state of residence, and country of origin. Job/skill characteristic variables are included for educational attainment, part-time/full-time status, industry, and occupation. 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. As has been noted above, the only

data on job tenure available from the unit-record files of the *Labour Mobility Survey* are on whether a worker had been in a job for less than or more than one year and those data have 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 structural change or secular trend in displacement it is therefore 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.⁶

Worker displacement is a demand-side phenomenon initiated by organisations that employ labour, and therefore cyclical indicators that primarily represent cyclical fluctuations in labour demand – employment growth and the vacancy rate – have been chosen. First, the rate of employment growth (persons) in each twelve month sample period disaggregated by industry and state; and second, the vacancy rate in each year disaggregated by state. Other studies of the determinants of worker displacement have generally used 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 also considered.

Whether there has been a secular or structural 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. This latter approach has been the method for studying structural changes in most existing studies of worker displacement.

Identification of the year effects and cyclical variables is achieved by the different level of disaggregation of each variable. Specifically, the employment growth variable is identified from year effects by inter-industry and inter-state variation, and the vacancy rate variable is identified from year effects by inter-state variation.

b. Basic model

The model for the determinants of worker displacement is estimated as a Probit model. The main results are presented in Table 2. 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 latter 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 a change in the dummy variable from zero to one.⁷

A range of demographic and job/skill characteristics are found to affect worker displacement.⁸ 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 electricity/gas/water) and in the finance industry are found to have relatively low rates of retrenchment.

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.

In interpreting the findings on year effects attention is focused on the specifications with year dummy variables. This is because for both males and females, a Wald test rejects the specification with the time trend against the specification with the full set of year dummy variables. Nevertheless, in the specification for males with a time

trend that variable is positive and significant, indicating an increasing incidence of displacement that is separate from business cycle changes.

In the specifications with year dummy variables significant effects are found for both males and females. (Note that by design the alternative specification with restricted set of dummy variables is not rejected against the specification with full set of dummy variables). For both groups the incidence of displacement 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.

From the specifications with restricted year effects it is found that 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.

The main finding from the 'basic' analysis of worker displacement in Australia between 1984 and 1996 is therefore that the incidence of displacement was significantly higher in the early 1990s than 1980s, but that thereafter those effects have declined in magnitude. The period in the early 1990s where an increase in worker displacement occurred spans both the end of a recession and beginning of an expansion. The finding that any structural increase in displacement is likely to have been temporary rather than a

permanent phenomenon would seem to have important implications for policy – for example, in making a decision on whether extra adjustment assistance is required.

On the issue of methodology it is worth reiterating that using a time trend variable to measure structural change a significant positive trend in displacement is found for males; but this specification is rejected against the more flexible year effects approach. In other words, using the time trend specification could give the misleading impression of an increase in displacement growing steadily in magnitude over time

Interestingly, the findings on time-series patterns in worker displacement in Australia appear similar to some recent findings for the United States. From a descriptive analysis Farber (2001, p.12) concludes that: “What appears clear is that job loss was slow to decline in the early stages of the economic expansion of the 1990s relative to the decline in the economic expansion of the 1980s. Overall job loss rates did decline substantially beginning in the 1995-97 period...”. This may indicate an international phenomenon of above-normal worker displacement beginning in the recession of the early 1990s and continuing for some limited time into the subsequent expansion. Farber’s descriptive analysis also supports the necessity of a flexible approach to modelling structural change such as has been applied in this study.

c. Findings for disaggregate workforce groups

As well as understanding that a change in the aggregate time-series pattern of worker displacement occurred, it is also of interest to know which workforce groups were affected by that change. 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, and occupation. Results from estimation of these models

are reported in Tables 4 and 5. Table 4 shows the estimated year effects within disaggregated workforce groups. Table 5 reports results from tests of the joint hypothesis that year effects for 1991, 1992, 1994 and 1996 are equal to zero.

The rise in displacement for males appears to have been concentrated within education attainment and occupation sub-groups, but to have affected all age groups and industries. Disaggregating by education attainment, for the group who have not completed high school significant year effects are found for all years from 1991 to 1996, and for the three lower education attainment groups it is not possible to reject at the 5% level the hypothesis of significant year effects. By occupation significant year effects occur primarily for workers whose last job was as a clerk, labourer, or plant/machine operator, and for these groups it is not possible to reject the hypothesis of significant year effects between 1991 and 1996. Year effects are more uniform between age and industry of last job categories. Significant year effects are found within all age and industry sub-groups, and it is not possible to reject the hypothesis of significant year effects between 1991 and 1996 for any sub-group. It does seem, however, that the industry year effects are quantitatively largest for the construction and finance/property/business service industries.

Patterns of displacement in disaggregate workforce groups are generally quite similar between females and males. (For females some of the disaggregate groups contain a relatively small number of observations so it is sensible to put greater weight on the findings for males.) Significant year effects, and rejection of the hypothesis of zero year effects between 1991 and 1996, are found for the education attainment group who have not completed high school, and for workers whose last job was as a labourer or

plant/machine operator. Significant year effects are found for most industry groups, although the magnitude of those effects seems strongest in the transport/storage and finance/property/business services industries. For females (in contrast to males) displacement appears to have been concentrated by age – the hypothesis of zero year effects between 1991 and 1996 can be rejected only for the group aged 45-54 years.

The pattern that emerges from analysis of the incidence of worker displacement for disaggregate workforce groups is that it was primarily workers with low education attainment 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 where, for example, there is some evidence that rates of displacement for more educated workers rose relative to those for less educated workers (see for example Aaronson and Sullivan, 1998, and Farber, 2001).

d. Sensitivity analysis

How robust are the findings on the year effects on worker displacement that have been presented? Our judgement is that the main reason that the results would not be robust is from a failure to effectively separate cyclical and structural effects.⁹ Hence, in this sub-section a range of checks, designed to assess whether the year effects are robust to alternative methods of controlling for cyclical effects, are presented. Before starting this exercise it is however important to make one preliminary point – This is that the increase in the probability of displacement that is found extends across periods of

contraction (1990-91) and expansion (1992 onwards). Hence, 'a priori' it does not seem likely that the results can be explained by mis-measurement of the business cycle.

Results from the robustness checks are presented in Table 5. 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. However Table 5 shows that, 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 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 these 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.¹⁰

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.

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 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.

A number of other sensitivity checks that confirmed the robustness of the main results were also conducted.¹² First, a national employment growth rate variable was substituted for the state by industry employment growth rate. This is to control for the

possibility either that rates of worker displacement are more closely related to national than state economic conditions or that state rates of employment growth are measured with significant error. Making this substitution is found to have no appreciable effect on the magnitude or significance of year effects for males or females. (Identification of the national employment growth rate variable is achieved by including only the restricted set of year effects.) The second issue relates to the restrictive specification adopted that forces constant age group effects across the whole sample period. To investigate this, a fully flexible specification that allows separate year effects for each of the six age groups is introduced. Third, to control for changes in men's retirement decisions over the sample period, the main specifications are re-estimated after omitting the oldest age category (those aged 55-64). The fourth issue relates to the changing labour force participation decisions of women over the sample period. It is not possible to account for changes in the decision by women to work or not as the sample is conditional on individuals who worked at least some point during the reference year. However, to control for the possibility that women with children may opt to work only part time, attention is restricted to a sample who worked full time in their last job (or current job if not job mobile). Fifth, the impact of the business cycle variables on displacement is allowed to vary by both industry and occupation. In each case, the main conclusion of a significant structural change in the 1990s compared to the 1980s is unchanged.

The robustness checks that have been undertaken therefore do not affect the finding that both males and females in Australia experienced very large increases in the probability of displacement in the early 1990s, after which time those effects have declined in magnitude. The 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.

e. Causes

An issue of obvious interest is the possible causes of the increase in worker displacement. To consider this question it is useful to have in mind a simple 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. Voluntary exits or quits from an organisation may act as a substitute for these methods of adjustment, or may be a factor that causes subsequent adjustment. Hence, changes in the incidence of displacement can derive from three sources – variation in the rate of growth in employment; variation in the rate of workforce adjustment; and variation in the extent to which an organisation uses each of its possible methods for adjusting labour demand.

In work not reported in this paper we have sought to disentangle these possible effects. Unfortunately, data limitations have restricted the scope of the analysis, which is why the results are not reported in detail. In the analysis we have re-estimated the Probit model of the incidence of displacement including the rate of employment growth as an explanatory variable, but also including the variance of 3-digit industry employment

growth within 1-digit industry by state groups as an explanatory variable to proxy for variation in the rate of workforce adjustment. It is found that the 'workforce adjustment' variable is not significant. It seems possible to conclude therefore that increases in the incidence of worker displacement are explained either by 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 empirically to distinguish between these hypotheses. There is, however, one argument that suggests the former explanation may have more support than the latter explanation. This point comes from considering the types of factors that would explain changes in the relative role of displacement as an adjustment mechanism. Such factors tend to be institutional, such as a weakening of union representation, or policy reform. Generally, such changes would not be expected to occur as temporary phenomena, as is the case with the observed structural change in worker displacement. This suggests that it may be appropriate to put more weight on a temporary increase in the extent of workforce adjustment as an explanation for the increase in worker displacement in Australia in the early 1990s.

V. Conclusion

This study has examined the incidence of displacement for individual workers in Australia between 1984 and 1996. First, using a variety of business cycle controls, it is found that displacement follows a counter-cyclical pattern. Second, after controlling for cyclical effects, 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. The finding that the increase in worker displacement is likely to have been temporary rather than permanent has been noted to have important implications for policy-making. Third, analysis for disaggregate 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.

The findings for Australia provide an interesting cross-country perspective to recent results on the incidence of worker displacement for the United States. There is some evidence that the finding of a large but temporary increase in worker displacement in the early 1990s, that spans both the end of a recession and beginning of an expansion, is common to both countries. This may suggest the operation of common international factors driving the incidence of worker displacement. But the 'democratisation' of worker displacement that appears to have occurred during this period in the United States does not seem to have occurred in Australia. This disparity could reflect differences between the countries in the process of adjustment to the forces underlying the increase in the incidence of displacement.

Finally, 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, in future work 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. Studies by Monks and Pizer (1998), Boisjoly et al. (1998) and Valletta (1999) use a trend variable to capture structural change in the incidence of worker displacement, Polsky (1999) compares five year periods, and Bernhardt et al. (1999) examine inter-cohort differences. To capture cyclical influences two of these studies use only a rate of unemployment variable, one uses the rate of unemployment and rate of employment growth by industry, one uses percent change in GDP, and the other has no control for the business cycle. Two studies that model structural change using regression analysis with year effects are Farber (1997) and Gottschalk and Moffitt (1999); however, neither includes a control for business cycle effects.
2. Aaronson 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.
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. 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.
7. 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.

8. Because of space considerations these results are not reported. Full results are available on request from the authors.

9. Another possibility would be omitted variable bias. For example, suppose that firm size is inversely correlated with the incidence of displacement, and that the distribution of firm size changes over the period of our sample. This 'firm size effect' on displacement would then be captured in the year effects. However, it is difficult to think of omitted variables that could impart a pattern of bias to the year effects such as is found – that is, increasing in the early 1990s and thereafter decreasing in size.

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. Results from these extra robustness checks are available on request from the authors.

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Table 1: 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 2: 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)
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 3: 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

Note: Asterisk denotes significant at the 5% level.

Table 4: Test of hypothesis of joint significance of year effects – 1991, 1992, 1994 and 1996 – p values

	Males	Females
Education		
Degree	0.200	0.439
Post-secondary qualifcn.	0.001	0.087
High school	0.005	0.589
Less than high school	0	0.001
Age		
20-24	0.008	0.208
25-34	0	0.061
35-44	0	0.086
45-54	0.045	0.038
55-64	0.020	0.373
Last occupation		
Manager	0.026	0.745
Professional	0.168	0.154
Para-professional	0.304	0.490
Salesperson	0.167	0.327
Tradesperson	0.059	0.070
Plant and machine operators	0.002	0.017
Clerk	0.003	0.163
Labourer	0	0.031
Last industry		
Manufacturing	0.002	0.002
Construction	0	0.106
Government/Defence	0.025	0.027
Finance, property and business services	0.006	0.017
Education/Health	0.004	0.239
Transport and storage	0.039	0.002
Wholesale and retail trade	0.031	0.002

Table 5: 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 (0.0028)	0.0008 (0.002)	0.0044 (0.003)	0.0000 (0.000)
1989	0.0011 (0.003)	-0.0008 (0.003)	0.0026 (0.003)	-0.0022 (0.003)
1991	0.0169* (0.003)	0.0137* (0.002)	0.0170* (0.003)	0.0152* (0.007)
1992	0.0115* (0.002)	0.0108* (0.002)	0.0079* (0.002)	0.0290* (0.008)
1994	0.0087* (0.002)	0.0113* (0.002)	0.0153* (0.002)	0.0405* (0.014)
1996	0.0056* (0.002)	0.0058* (0.002)	0.0099* (0.003)	0.0018 (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		-0.0215*		

employment growth - Males		(0.005)		
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	0.050	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	-0.0017	0.0002	0.0147

	(0.003)	(0.002)	(0.002)	(0.009)
Business cycle				
Rate of employment Growth	-0.0133 (0.007)		0.0119 (0.018)	-0.0167 (0.008)
Vacancy rate	-0.0082 (0.004)	-0.0123* (0.004)	-0.0346* (0.012)	-0.0089 (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)			-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				-0.0146

rate				(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.

Figure 1

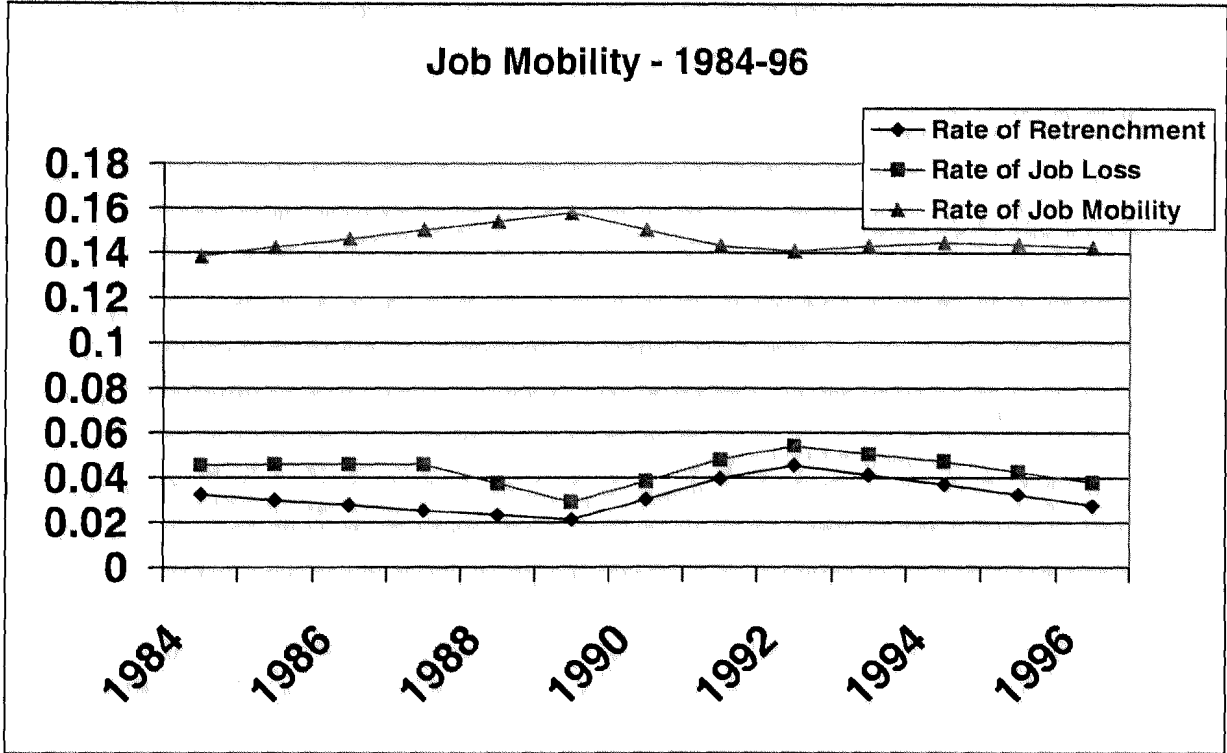
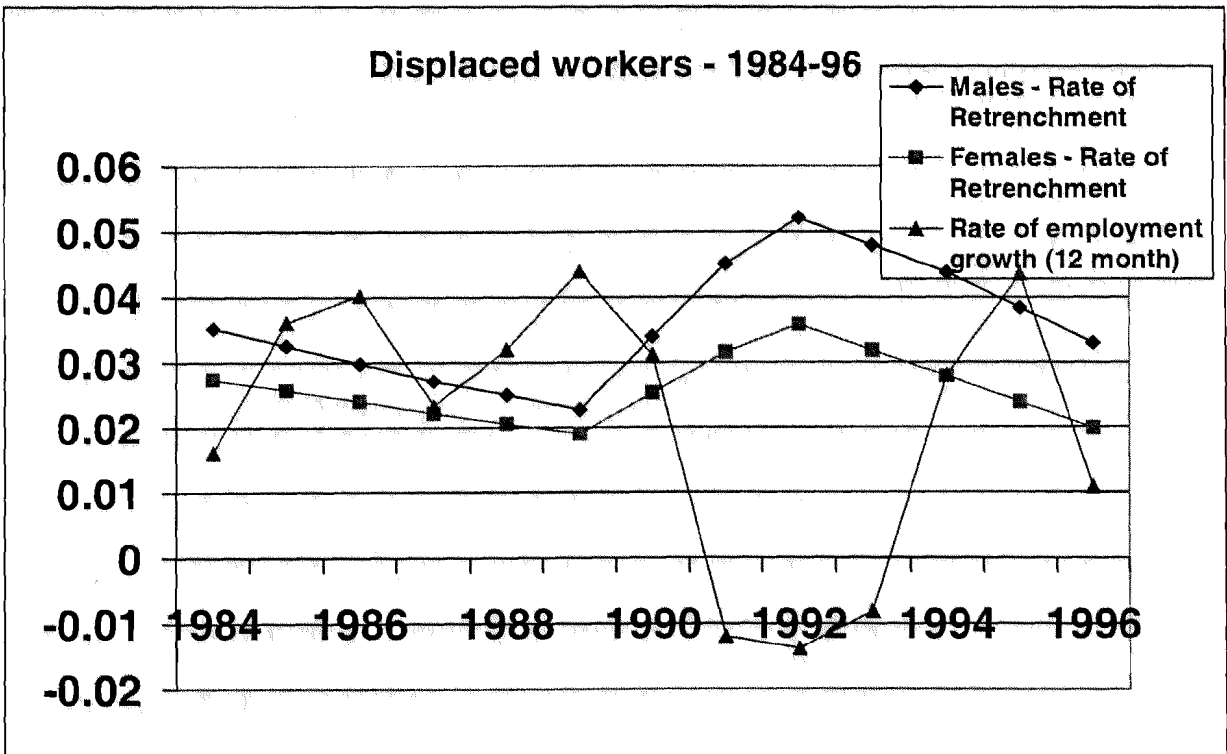


Figure 2



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

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