

**Determinants of employment and
labour force participation: a cohort
analysis of indigenous and
non-indigenous Australians, 1986–96**

M.C. Gray and B.H. Hunter

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Mr Matthew Gray is a Post-doctoral Fellow and Dr Boyd Hunter is a Research Fellow at the Centre for Aboriginal Economic Policy Research, The Australian National University. Dr Hunter is also a Ronald Henderson Research Fellow.

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Professor Jon Altman
Director, CAEPR
The Australian National University
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Table of Contents

Summary.....	iv
Acknowledgments.....	v
Introduction	1
Longitudinal analysis of the probability of employment and participating in the labour force, 1986, 1991 and 1996 Censuses	2
Statistical issues.....	4
Data	5
Estimation results	5
Prospects for achieving statistical equality in employment and labour force participation	10
Policy discussion	12
Appendix A	15
Appendix B	16
Appendix C	18
References	20

Tables

Table 1. Marginal effects on the probability of non-CDEP scheme employment, 1986–96	6
Table 2. Marginal effects of on the probability of participating in the labour force, 1986–96.....	9
Table 3. Prospects for statistical equality in employment and participation in the labour force, fixed effects estimates	11
Table A1. Descriptive statistics for regressions	15
Table B1. Estimates of the probability of non-CDEP employment, males.....	16
Table B2. Estimates of the probability of non-CDEP employment, females	17
Table C1. Estimates of the probability of participation in the labour force, males	18
Table C2. Estimates of the probability of participation in the labour force, females.....	19

Summary

Data from the 1986, 1991 and 1996 Censuses is used to conduct a cohort analysis of the probability of employment and participating in the labour force for indigenous and non-indigenous males and females. Single-year age cohorts are used in the first ever longitudinal regression analysis of indigenous labour force status. The other contribution of this paper is to analyse labour market processes at an aggregate level by using census information on the entire Australian population (separately for indigenous and other Australians). By distinguishing aggregate and micro-labour market processes the analysis details what happens to the population, on average, as the level of educational attainment increases.

This paper demonstrates that factors which are related to the probability of employment and participating in the labour force for the indigenous population differ from those for the non-indigenous population. At an aggregate level, it is found that the increasing educational attainment of indigenous Australians which occurred between 1986 and 1996 has not resulted in the anticipated improvements in employment levels. In contrast, employment was found to be positively related to increases in educational attainment in the non-indigenous population. Marital status is found to be the most important determinant of the probability of employment and participating in the labour force for indigenous people, especially females. This may reflect the large financial disincentives to work facing many married indigenous females.

Longitudinal analysis of the probability of employment and participating in the labour force, 1986, 1991 and 1996 Censuses

The cohort nature of the data constructed for this study allows the first longitudinal regression analysis of the determinants of labour force status for indigenous and non-indigenous Australians. The advantage of this approach is that statistical techniques can be used to control for unobservable differences between the indigenous and non-indigenous populations such as ability and schooling quality, as well as discrimination and other attitudes.

Probability of non-Community Development Employment Projects scheme employment

- After taking into account cohort specific factors, it is found that region of residence has no effect upon the probability of employment of indigenous males and females. In contrast, region of residence is an important determinant of the probability of employment of non-indigenous males and females.
- Difficulty in speaking English plays only a minor role in affecting the probability of employment for indigenous Australians, while for non-indigenous Australians it is a significant factor in reducing the probability of employment.
- An increase in the proportion of a cohort with a university degree has no statistically significant effect upon the probability of employment for indigenous cohorts. In contrast, for non-indigenous cohorts, an increase in the proportion with a degree plays an important role in increasing the probability of employment.
- The role of diploma level qualifications in increasing the probability of employment is somewhat surprising. For indigenous males and females, and non-indigenous males, diploma level qualifications appear to have no effect upon the probability of employment. For non-indigenous females, an increase in the proportion of a cohort having a diploma level qualification is associated with a significantly decreased probability of employment. One reason for this apparently anomalous result may be that diploma level study is an intermediary step for many women who eventually upgrade their qualification to a degree.
- For indigenous males, the regression estimates show that being married is associated with a lower probability of being employed as compared to being single. In contrast, for non-indigenous males being married or widowed, divorced or separated is associated with a significantly increased probability of being employed. Being married or widowed, divorced or

separated is associated with a lower probability of being employed for indigenous and non-indigenous females.

Probability of participating in the labour force

- A striking finding for indigenous males is that none of the explanatory variables are significantly related to the proportion of a cohort which is participating in the labour force and therefore other factors must explain the decision to participate in the labour force. For indigenous females, having a diploma level qualification and marital status are found to be significant determinants.
- The probability of participating in the labour force for non-indigenous Australians is found to be related to a wide range of factors including region of residence, level of educational attainment and marital status.

Prospects for achieving statistical equality in employment and labour force participation

The estimates allow an analysis of the effects of achieving statistical equality in educational attainment and region of residence between indigenous and non-indigenous Australians on employment and labour force participation. It is found that moving indigenous people to the buoyant job markets in major urban areas would have only a limited effect on narrowing the gap between indigenous and non-indigenous employment rates. Similarly, increasing the post-secondary educational attainment of indigenous Australians to that of non-indigenous Australians would not resolve indigenous labour market disadvantage. Other difficult to measure factors, such as unobserved heterogeneity (discrimination and lack of worker motivation), are likely to be as important as the number of jobs available in an area.

Policy discussion

It is often asserted that one of the keys to improving indigenous labour market outcomes is increasing the level of formal education of the entire population, especially younger age cohorts. The analysis outlined in this paper casts some doubt upon this presumption. This is not to suggest that increases in educational attainment which have been achieved by indigenous cohorts are not without benefit as evidenced by the effect they have on incomes. However, formal education needs to be combined with a series of other policies aimed at combating indigenous labour market disadvantage. The results clearly demonstrate that a large part of indigenous employment disadvantage is not simply due to lack of educational attainment and the level of labour demand in the regions where indigenous Australians live but is also due to unobserved differences such as schooling quality, assimilation, discrimination and other attitudes.

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Introduction

Indigenous Australians experience significant labour market disadvantage relative to other Australians. This disadvantage manifests itself in terms of lower incomes, lower employment rates, lower labour force participation rates and higher unemployment rates (Daly 1995; Hunter and Gray 1999). Indeed, poor employment prospects are widely recognised as the primary factor underlying indigenous poverty (Altman and Hunter 1998). Clearly, understanding the determinants of indigenous labour force status is a prerequisite to the formulation of a successful policy to address indigenous living standards.

Henderson (1975) pointed out that many indigenous people face multiple problems in securing employment including being located in areas where there are insufficient jobs, competing with better trained and more experienced non-indigenous workers, and dealing with prejudice among some employers who regard all indigenous people as lazy and unreliable workers. Studies of indigenous labour force status since Henderson have similarly emphasised the role of education, training, labour demand, geography and discrimination, but have also discussed the role of arrest, health, social environment, financial incentives and new institutional features such as the Community Development Employment Projects (CDEP) scheme (Daly 1995; Hunter 1997a; Borland and Hunter 1999; Daly and Hunter 1999).¹

While these studies have added to our understanding of how labour market processes affect indigenous people, they are limited by the fact that they were based solely on cross-sectional data and consequently, have no time dimension to the analysis. This paper utilises a technique which follows groups with similar characteristics (cohorts) over time through the 1986, 1991 and 1996 Censuses, to present the first longitudinal estimates of the determinants of indigenous employment and labour force participation. The other contribution of this paper is to analyse labour market processes at an aggregate level by using Census information on the entire population (separately examining the full count for indigenous and other Australians). By distinguishing aggregate and micro-labour market processes, the analysis details what happens to the population on average (and to particular groups within the population), rather than to particular individuals, as the level of educational attainment increases.

The unit of analysis used is a 'cohort' which can be uniquely identified in successive censuses by its sex, age and indigenous status. Whilst there is no pretence of following the same individuals across time, Deaton (1985), Verbeek and Nijman (1992), and Hunter and Gray (1998) describe how carefully constructed cohorts permit a 'pseudo panel' or 'longitudinal' analysis. The cohort analysis in this paper is an analysis of grouped data; that is, average data for each cohort are used rather than information at the level of the individual. While it is preferable, for the purpose of analysing underlying behavioural responses, to have information at the level of the individual over time, there is no nationally representative survey that contains longitudinal information on indigenous persons.

The major advantage of the grouped data cohort analysis used in this paper is not the grouped nature of the data, but rather the fact that it permits a longitudinal regression analysis of the employment status of both indigenous and non-indigenous Australians. There is currently no representative longitudinal survey of the indigenous population. The technique facilitates a more subtle analysis of the determinants of labour force status than cross-sectional studies because it controls for the unobservable characteristics of both indigenous and non-indigenous Australians. Given that it is usually not possible to observe characteristics such as ability, schooling quality, assimilation, discrimination and other attitudes, the failure to control for such characteristics can induce a significant bias in the empirical results.

This paper is a companion piece to Hunter and Gray (1999) which analyses the determinants of personal income for indigenous males and females using cohort data from the 1986, 1991 and 1996 Censuses. The income variable used in that study aggregates income from all sources (including from the social security system and wages and salaries). This means that the level of income received is determined by labour force status, wages and salaries received (if

employed), social security payments and other income such as rent and interest. Therefore, to understand the effects of an explanatory variable on an individual's personal income it is important to understand the effect of these explanatory variables on the probability of employment.

Nearly 25 per cent of indigenous employment is in the CDEP scheme. Under the CDEP scheme indigenous communities receive a grant of a similar size to their collective unemployment benefit entitlement to undertake community defined 'work'. The benefit recipients are then expected to work part-time for their entitlements. Historically the CDEP scheme was available on a one-in-all-in basis for each community. The current policy that evolved gradually in the mid-1990s, however, allows the unemployed the choice as to whether or not they participate in the scheme, when the CDEP scheme is provided in a community.

Originally the CDEP scheme was available only to remote communities but in recent years its geographic dispersion has increased and there are numerous CDEP schemes in urban areas. Nonetheless, CDEP schemes are predominantly concentrated in rural and remote regions that have very poor non-CDEP employment prospects (Altman and Hunter 1996). It is unlikely that there is significant displacement of non-CDEP employment with CDEP employment.

For the remainder of this paper, employment is defined to include employers, the self-employed and wage and salary earners, but to exclude CDEP scheme workers. Since CDEP scheme workers are, by definition, in the labour force, by excluding them from the definition of employment used here they are effectively treated as being unemployed. A reason for excluding CDEP employment from our measure of employment is that employment in other labour market programs, for both the indigenous and non-indigenous populations, is excluded from the definition of employment. The decision to treat CDEP employment as being equivalent to being unemployed is not without its difficulties. A number of authors have argued that CDEP employment has many of the attributes of employment (Sanders 1993; Smith 1994).² However, because there was no equivalent of the CDEP scheme in the non-indigenous community during the period analysed, the above definition is necessary for this cohort analysis to compare the determinants of indigenous and non-indigenous labour force status.

The following section sets out the theoretical and empirical issues involved in analysing labour force status over time. The third section of the paper describes the extent to which various factors affect the probability of having non-CDEP scheme employment and of participating in the labour force for indigenous and non-indigenous males and females. The final section discusses the implication of the results for policy, especially indigenous education policy.

Longitudinal analysis of the probability of employment and participating in the labour force, 1986, 1991 and 1996 Censuses

Single-year age cohorts are used to permit the first longitudinal regression analysis of the determinants of employment and labour force participation for indigenous and non-indigenous Australians, using data from the 1986, 1991 and 1996 Censuses. The advantage of this approach is that statistical techniques can be used to control for unobservable differences between the indigenous and non-indigenous populations. In principle, this provides a more accurate assessment of the effect of education on employment and labour force participation than is possible in cross-sectional estimates.

The validity of inter-censal comparisons of indigenous labour force status depend, in part, upon which Australians identified themselves as indigenous in the 1996 Census, but did not in previous censuses. Hunter (1998) has shown that it is possible to dismiss bogus identification or 'census vandals' as a major factor underlying the large non-biological increases in the indigenous population. The apparent lack of compositional change in the indigenous population identified in that paper means that census data can be taken at face value and that inter-censal comparisons of labour force status are valid.

All of the existing empirical work on the determinants of the probability of employment for indigenous Australians has used cross-sectional data. As indicated above, it is not possible to control for unobserved differences between individuals, such as ability or motivation, when cross-sectional data are used. If there are systematic differences between individuals which are correlated with the explanatory variables as well as the probability of employment or participating in the labour force, then estimates which do not take account of such factors will be biased and inconsistent and therefore misleading.

As discussed above, the definition of employment used in this analysis excludes CDEP participants from the definition of employment but includes them as participating in the labour force. In other words they are treated as being unemployed.³ An individual is defined as participating in the labour force if they are employed or if they are not employed but are actively searching for a job. Labour force participation is a measure of labour supply.

In general, a person's decision as to whether to supply labour or not involves a trade-off between time spent at home on 'market-substitution' activities (for example, cooking, childcare, growing vegetables), leisure, and paid work. Clearly the decision is highly complex and involves many factors. For example, the dynamics within a household are important and the labour supply decision needs to be considered in terms of the household, or family and the interactions that occur within it. For females, the stage of the lifecycle is also likely to be very important as many women work in different ways at various stages in their lives as the balance between paid work and child-bearing responsibilities fluctuates. Unfortunately, it is not possible to directly analyse the household labour supply decision using grouped data, although the marital status variable may provide some insights.⁴ In addition to the financial incentives regarding the decision to participate in the labour market, there are also likely to be social and cultural factors that differ markedly between indigenous and non-indigenous individuals and may even differ between cohorts within each of these groups.

The factors that are related to the decision to participate in the labour force are very similar to those that are related to the probability of employment. Factors that are related to the probability of employment will be inextricably linked to the participation rate because the decision to participate in the labour force is usually related to the probability of finding employment. For example, the decision to participate is conditioned upon actively seeking work that, in turn, improves one's employment prospects. However, job search and labour force participation are not a costless activity and therefore the decision as to whether to search for work must involve some balancing of the costs of job search with the chance of finding a job and the potential returns.⁵ Institutional features of the indigenous labour market, such as CDEP scheme employment, increase the supply of local jobs and consequently may reduce the costs of participating in the labour force relative to what it would otherwise be.

The strict criteria used for determining whether an individual is participating in the labour force require not only that an individual is either working or is not working but that they are actively searching for work and available to start work immediately if offered a job. An individual may not meet these criteria for being in the labour force but nonetheless want a job. According to the Australian Bureau of Statistics (ABS) labour force definitions, an individual who wants work, is not actively searching for work, but is available to start work within four weeks is classified as being a discouraged worker. A slightly broader definition of the potential workforce is found in the ABS category, 'being marginally attached to the labour force'. This definition also includes those who want to work and are actively looking for work but are not available to start work immediately in the labour force.

There are a number of reasons why a person may want a job but is not actively looking for work. These include: they feel that they cannot find a job; the costs of searching are too great; they have given up hope of finding employment; and, they are affected by social security disincentives which mean that it is not worth their while taking a job even if offered one (Daly and Smith 1998; Hunter and Daly 1998). If the indigenous population has a higher proportion of discouraged workers than the non-indigenous population then the census-based definition of

unemployment will understate the levels of unemployment in the indigenous population relative to those in the non-indigenous population.

Statistical information on discouraged and marginally attached workers for the Australian population as a whole is available from the ABS's Labour Force Survey and information on indigenous job seekers is available on a one-off basis from the National Survey of Aboriginal and Torres Strait Islanders (NATSIS). In September 1994, 9.0 per cent of the Australian civilian population aged 15 and over were discouraged workers, while for the indigenous population the corresponding figure was 14.1 per cent.⁶ The difference between the indigenous and non-indigenous population is even starker when marginally attached workers rather than discouraged job seekers are considered. In September 1994, 9.5 per cent of the Australian population were marginally attached to the labour force as opposed to 18.8 per cent of the indigenous population.⁷ That is, indigenous individuals are significantly more likely to be discouraged workers or marginally attached to the labour force than the non-indigenous population.

In this study, all explanators are measured as the proportion of the cohorts with the relevant characteristic. The variables are therefore bounded in the range from zero to one. The explanators of the probability of employment and participation in the labour force are similar to those used in other studies (Miller 1987, Miller 1989, 1991; Jones 1991; Ross 1991; Daly 1993). The specification used in the empirical analysis includes measures of educational qualification, age, age left school, English difficulty, place of residence (section-of-State), marital status, and an indicator for the relevant census year. Cohorts under the age of 22 years are excluded to avoid confounding the effects of the transition from education with labour market effects. Cohorts aged 65 years and over are excluded because we are interested in the behaviour of the working-age population. The summary statistics of the data used in the regression analysis are presented in Appendix A.

Statistical issues

The conventional approach to estimating the determinants of the probability of employment and participating in the labour force uses multivariate regression techniques such as logit or probit regression models. The grouped nature of the cohort data means that the dependent variables are continuous (the proportion of a cohort which is employed or participating in the labour force) making standard probit or logit analysis inappropriate. In addition, the dependent variable is bounded between the values of zero and one and consequently the standard ordinary least squares estimation (OLS) is also inappropriate (see Johnston and DiNardo 1997).

There are a number of statistical techniques that can be used to analyse this type of data. This paper adopts the approach of transforming the dependent variable using a logit transformation and then using weighted OLS on the transformed data.⁸ This procedure ensures that the fitted probabilities will lie between zero and one.

Unobserved heterogeneity is taken into account using a cohort specific effect (fixed effect). The cohort specific variables (also known as cohort dummies) pick unobserved differences between cohorts that are constant over time and are not included in the regression model. These factors may include, among other things, differences in quality of schooling, socioeconomic background, cultural differences, and discrimination. When using individual level data it is often argued that the fixed effect (FE) will pick up the unobserved differences in innate ability. When using cohort data, unless we are prepared to argue that there are systematic differences in innate ability between cohorts, this interpretation is no longer valid.

FE models estimate the effects of a factor on labour force status by using variation of this factor within a cohort over time. That is, changes in the proportion of a cohort employed or participating in the labour force are explained by the within cohort changes over time in the explanatory variables. For example, the effects of having a degree on the probability of employment are estimated by relating changes over time in the proportion of a cohort with a degree to changes in the proportion of a cohort employed after taking into account all the other factors included in the model.

The calendar year dummy variables are excluded from the FE model because there is a deterministic relationship between age, cohort and the current calendar year. In other words, given the value of any two of these variables the value of the third is pre-determined. This means that the estimates of the effects of age on the probability of employment and participating in the labour force will pick up the effects of both age and calendar year.⁹

The FE estimator requires that all variables that do not vary over time within a cohort, be excluded from the regression model. While such variables are not explicitly included in the model, their effects are controlled for by the cohort specific effect. Variables which, in principle, vary over time within a cohort may, in practice, not exhibit enough variation relative to the dependent variable for the effects of such variables on the dependent variable to be identified and are therefore excluded from the FE regression model. Age left school is excluded because it is, in practical terms, fixed and is therefore subsumed into the constant term under the FE estimates (Hunter 1998). In any case, the fact that there were significant changes in the census questions between 1986 and 1996, means that the variation of age left school for particular cohorts between the 1986, 1991 and 1996 Censuses is more likely to indicate measurement error than genuine variation in age left school.

Data

The data used in this paper have been constructed using the full counts of indigenous and other Australians for the last three censuses. Unpublished data on the characteristics for each single-year age group for all males and females who identify as indigenous and for other Australians, forms the basic unit of analysis. The construction of this cohort data is described in detail in several recent publications. For example, Hunter (1998), Hunter and Gray (1998), Gray, Hunter and Schwab (1999), and particularly, Hunter and Gray (1999).

Estimation results

In this section, the results of estimating the determinants of the proportion of a cohort employed and the proportion participating in the labour force are presented and discussed. The models are estimated separately for indigenous and non-indigenous males and females.

Probability of non-CDEP employment

As mentioned above, if there are systematic unobserved differences between cohorts which are correlated with the explanatory variables as well as the probability of employment or participation in the labour force, then the OLS estimates of the effects of such factors on income will be biased and inconsistent. That is, the estimated effects will systematically differ from the true effect and no amount of increases in the sample size will help.

The full estimation results are presented in Appendix B. Because the effects of changes in the explanatory variables on the probability of employment varies with the value of all the explanatory variables in the model it is not generally useful to simply report the coefficients; we therefore present the 'marginal effects' for each of these variables. The marginal effects give the change in the predicted probability of employment for a change in a variable from the mean value to the mean plus one standard deviation, holding all of the other variables at their respective means.

The estimated effect represents how employment prospects for a cohort change with changes in education, marital status and region of residence. The mean values for the variable are calculated separately for each of the samples (indigenous males and females and non-indigenous males and females). The standard deviations are calculated for the entire population of males and females in order to facilitate some comparisons between the indigenous and non-indigenous populations. Thus the 'marginal effects' presented in Tables 1 and 2 give an indication of the relative importance of the various factors. The penultimate section presents an alternative representation of these marginal effects by estimating how the probability of employment and

participation would change for the indigenous population if they had the characteristics of the non-indigenous counterparts and vice versa.

The inclusion of the cohort specific dummy variables in the FE estimates leads to several changes in the coefficient estimates, and their statistical significance, indicating that these variables are correlated with the unobserved heterogeneity and hence the estimates of the effect of these variables in the OLS estimates are biased and inconsistent. We therefore focus on the results of the FE estimates as being more reliable and refer to the results of the OLS estimates only when illustrating the potential biases from not using longitudinal data to control for unobserved heterogeneity.

Table 1. Marginal effects on the probability of non-CDEP scheme employment, 1986–96

	Indigenous		Non-indigenous	
	OLS	FE	OLS	FE
Males				
Major urban	1.7*	1.3	0.5	8.3*
Difficulty in speaking English	-0.8*	-0.7	0.4	-9.0*
Degree	0.1	0.1	1.0	4.7*
Diploma	-0.8	-0.1	-3.4*	-2.4
Widowed, divorced or separated	-2.9	-5.3	-6.7*	5.7*
Married	-4.5	-8.0*	-4.3*	4.8*
Left school aged 14 years or less	1.6*		-5.0*	
Left school aged 17 years or more	3.1*		-5.9*	
Females				
Major urban	3.3*	-0.2	3.5*	7.3*
Difficulty in speaking English	-0.6*	-1.0*	-4.6*	-4.9*
Degree	5.0*	-2.4	3.2*	17.3*
Diploma	0.0	-2.7	-12.3*	-19.4*
Widowed, divorced or separated	0.1	-25.3*	-19.1*	-18.7*
Married	-7.8*	-32.8*	-22.6*	-23.4*
Left school aged 14 years or less	4.7*		-15.1*	
Left school aged 17 years or more	1.3		-10.1*	

Notes: * signifies that the underlying regression coefficient is statistically significant.

The marginal effect for a variable is calculated as the difference in the predicted probability of employment when all of the explanatory variables are set equal to their mean value and when the variable for which the marginal effect is being calculated is set at one standard deviation above its mean value and all other variables are held at their mean value.

Source: Calculations based on Appendix Tables B1 and B2.

For non-indigenous males, the FE estimates suggest that an increase in the proportion of the cohort living in a major urban area, as opposed to a non-major urban area, significantly increase the probability of employment. Interestingly, for indigenous males, when unobserved heterogeneity between cohorts is controlled for, region of residence has no impact upon the probability of non-CDEP employment. This result is probably, in part, due to the rather crude measure of region of residence used.

When cohort FE are taken into account for indigenous females, living in a major urban area, as opposed to another area, has no effect upon the probability of employment. However, for non-indigenous females, living in a major urban area significantly increases the probability of employment.

Difficulty in speaking English has a significant negative effect on the predicted probability of employment for non-indigenous males but no effect for indigenous males when cohort specific FE are controlled for. Having difficulty in speaking English is estimated to significantly decrease the probability of employment for indigenous and non-indigenous females.

For the non-indigenous population, an increase in the proportion of a cohort with a degree is estimated to significantly increase the proportion of the cohort employed. An increase in the proportion of a cohort having a diploma is estimated to have no effect on the probability of employment for non-indigenous males. A surprising and unexpected result is that the FE estimates reveal that for non-indigenous females an increase in the proportion of a cohort having a diploma level qualification is associated with a significantly decreased probability of employment. This seemingly anomalous result is consistent with Hunter and Gray's (1999) finding that for non-indigenous females, an increase in the proportion of a cohort having a diploma decreased personal income. This may occur because many non-indigenous women upgraded their diploma to a degree level qualification in a period associated with a secular increase in female employment. For example, non-indigenous women aged between 30 and 35 in 1986 experienced a 7.5 percentage point decline in diplomas, a 9.0 percentage point increase in degrees and a 15.8 percentage point increase in employment, between 1986 and 1996. If these changes are representative of other cohorts, then the reduction in the proportion of non-indigenous females with diplomas does not represent a decline in the level of education, rather, it is probably a part of an ongoing process of upgrading educational qualifications in a changing labour market. Therefore, the effect of diplomas on employment and participation must be assessed in conjunction with the effect of having a degree level qualification.

The estimates of the effects of education on the probability of employment for indigenous males and females may be somewhat surprising. Having a degree or a diploma is estimated to have no statistically significant effect upon the probability of indigenous employment. A discussion of possible reasons for this and the policy implications is in the concluding sections of this paper.

For indigenous males, the FE estimates show that being married or widowed, divorced or separated is associated with a lower probability of being employed as compared to being single. In contrast, for non-indigenous males being married or widowed, divorced or separated is associated with a significantly increased probability of being employed. Being married or widowed, divorced or separated is associated with a lower probability of being employed for indigenous and non-indigenous females.

The relative importance of these factors is highlighted by the size of the marginal effects. Marital status is the most important factor for indigenous people. Being married is particularly important for indigenous females, with an increase in the proportion married by 35.2 percentage points (one standard deviation in Table A1) estimated to reduce the probability of employment by almost one-third (32.8 percentage points). This may reflect the large financial disincentives to work facing many married indigenous females (Daly and Hunter 1999). If the employment effect of marriage is driven by such disincentives, then we should expect there to be a similar effect on the probability of labour force participation. The marriage effect for indigenous females is substantially larger than for non-indigenous females.

While marital status is the most important factor for non-indigenous females living in a major urban area, having a degree or diploma level qualification is also a very important factor. A range of factors are important determinants of the probability of employment for non-indigenous males, particularly difficulty in speaking English, region of residence and, to a lesser extent, having a degree and being married or widowed, divorced or separated.

As mentioned above, a difference between the OLS and FE estimates of the effects of a variable on the probability of employment implies that the unobserved heterogeneity is correlated with that variable and therefore the OLS estimate is biased and inconsistent, whereas the FE estimate will be consistent. A comparison of the OLS and FE marginal effects in Table 1 reveals that there are a number of differences in the statistical significance or large differences in the magnitude of the marginal effects. For indigenous males and females and non-indigenous males, there may be biases in the estimated effects of marital status, and for indigenous males and females in the effect of region of residence, reinforcing the importance of using longitudinal data to control for unobserved heterogeneity.

There are several issues raised by excluding CDEP participants from the definition of employment. First, CDEP employment was not identified from the census data but rather, was estimated from the Aboriginal and Torres Strait Islander Commission's administrative data on CDEP and the NATSIS. This potentially introduces systematic measurement errors that may bias the estimates. Second, as noted above, CDEP employment does have some characteristics of employment. As a sensitivity analysis, a model with the probability of employment, including CDEP employment was estimated. The results do not differ markedly from the estimates of the probability of non-CDEP employment. The major differences are that the factors which are negatively associated with the probability of employment have a smaller negative effect on the probability of employment, including CDEP employment, than on non-CDEP employment. This is explained by the fact the majority of CDEP scheme participants have characteristics which decrease their probability of non-CDEP employment.¹⁰

Probability of participating in the labour force

The explanatory variables and estimation procedure used in the probability of participating in the labour force models are very similar to those used in the estimates of the determinants of the probability of employment.

The marginal effects of the explanatory variables on the probability of participating in the labour force are presented in Table 2. The definition of marginal effect is analogous to that used in Table 1 (that is, the effect on the participation rate of a one standard deviation change in an explanatory variable, holding all other variables at their mean value). As with the employment analysis, the following discussion focuses on the FE results, given the significant differences between various OLS and FE estimates. That is, the existence of significant unobserved differences in the quality of schooling, socioeconomic background, cultural differences, and discrimination between cohorts mean that the FE estimates of labour force participation are unbiased, and consequently more reliable.

For non-indigenous males, an increase in the proportion of a cohort living in a major urban region, as opposed to living in another area, is associated with an increased rate of participating in the labour force. For indigenous males, region of residence has no effect on the estimated probability of participating in the labour force. Region of residence also has no effect on the rate of labour force participation for indigenous females. In contrast, living in a major urban area is estimated to significantly increase the probability of participating in the labour force for non-indigenous females.

Difficulty in speaking English is associated with a significantly lower probability of participating in the labour force for non-indigenous males. In contrast, when cohort specific FE is controlled for, there is no effect on the probability of indigenous males participating in the labour force. For non-indigenous females, difficulty in speaking English is associated with a significantly

lower labour force participation rate. For indigenous females, difficulty in speaking English is found to have no effect on the rate of labour force participation.

For indigenous and non-indigenous males, having a degree or diploma is found to have no statistically significant effect on the rate of labour force participation. Having a degree is found to have no effect on the rate of labour force participation of indigenous females but having a diploma is estimated to reduce the rate of labour force participation.

In contrast, an increase in the proportion of non-indigenous females having a degree is found to increase the rate of participation in the labour force. Consistent with the findings for non-CDEP employment, having a diploma is estimated to decrease the rate of labour force participation.

Table 2. Marginal effects on the probability of participating in the labour force, 1986–96

	Indigenous		Non-indigenous	
	OLS	FE	OLS	FE
Males				
Major urban	0.8	1.0	-0.4	7.1*
Difficulty in speaking English	-1.0*	-0.7	0.5	-4.4*
Degree	-1.0	-1.4	0.5	-1.2
Diploma	-0.3	-1.1	-2.2	0.8
Widowed, divorced or separated	-0.6	-6.8	-3.3	3.6*
Married	-3.9	-5.2	-3.2	4.9*
Left school aged 14 years or less	0.8		-2.4*	
Left school aged 17 years or more	2.1		-4.5*	
Females				
Major urban	2.8*	0.3	2.7	7.0*
Difficulty in speaking English	-0.7	-0.7	-4.8*	-4.2*
Degree	6.0*	-3.2	2.6*	14.6*
Diploma	0.2	-3.6*	-10.4*	-19.9*
Widowed, divorced or separated	-1.2	-29.2*	-21.5*	-21.8*
Married	-10.8*	-37.4*	-25.2*	-25.5*
Left school aged 14 years or less	5.4*		-16.1*	
Left school aged 17 years or more	-2.0		-9.9*	

Notes: * signifies that the underlying regression coefficient is statistically significant.

The marginal effect for a variable is calculated as the difference in the predicted probability of employment when all of the explanatory variables are set equal to their mean value and when the variable for which the marginal effect is being calculated is set at one standard deviation above its mean value and all other variables are held at their mean value.

Source: Calculations based on Appendix Tables C1 and C2.

For indigenous males, marital status has no effect on the probability of participating in the labour force whereas for non-indigenous males being married or widowed, divorced or separated is estimated to increase the rate of participation in the labour force. For females, being married or widowed, divorced or separated significantly reduces the rate of labour force participation. However, consistent with the employment results, for indigenous females there are larger impacts from being married compared to non-indigenous females. This confirms Daly and Hunter's (1999) finding that the rate of financial return from securing employment is exceptionally low compared to their social security entitlements, especially for indigenous married females. Similarly, being widowed, separated or divorced has a significant impact on participation, presumably because marital status often signifies eligibility for Supporting Parent's Benefit or Widow's Pension. Such

incentive effects are also likely to be behind the result that married indigenous males are less likely to participate in the labour force than other married Australian males.

The relative importance of the factors affecting labour force participation is again captured by the size of the marginal effects. For example, marriage is the single largest factor effecting participation among indigenous females with a one standard deviation increase in the proportion of a cohort being married reducing the participation rate by 37.4 percentage points. In contrast, non-indigenous participation is affected more by region of residence and educational attainment. Non-indigenous females, for example, are 7.0 percentage points more likely to participate if the proportion living in major urban areas increases by 5.0 percentage points.

Comparison of the OLS and FE estimates suggest that there will be biases in estimates that do not take into account unobserved heterogeneity for a number of variables. Specifically, for non-indigenous males and females OLS estimates of the effects of region of residence, marital status and English difficulty may be misleading. For indigenous females, OLS estimates of the effects of marital status and region of residence may be biased.

Prospects for achieving statistical equality in employment and labour force participation

An objective of much indigenous policy has been to improve indigenous employment outcomes; for example, the *Indigenous Employment Policy* recently released by Peter Reith.¹¹ The 1987 *Aboriginal Employment Development Policy Statement* had an overall objective of assisting indigenous Australians to achieve broad equity with other Australians in terms of employment and economic status (Australian Government 1987). A major policy that has been advocated and implemented is increasing the levels of educational attainment for entire cohorts of indigenous Australians (Schwab and Campbell 1997). One of the rationales for this policy has been that increases in educational attainment will allow indigenous Australians to improve their labour market opportunities by increasing productivity, self-esteem and so forth. The fact that we use grouped census data allows us to explore the effects of increases in educational attainment for entire cohorts on labour market outcomes.

The analysis revealed that for indigenous males and females increases in the proportion of a cohort with post-secondary education has very little, if any, effect on the proportion of these cohorts in non-CDEP employment. In contrast, for non-indigenous males and females, an increase in the proportion of a cohort with a degree increases the proportion of the cohort employed. This result is in contrast to work done using unit record data from 1991 by Daly (1995) who found that having a degree of diploma level qualification increases an indigenous individuals probability of employment.

There are a number of possible explanations for this finding. Gray, Hunter and Schwab (1998) show that while the level of educational attainment of indigenous Australians increased between 1986 and 1996, the rate of increase was slower than for the non-indigenous population indicating that the indigenous population is falling behind the non-indigenous population. At the same time the ratio of non-CDEP employment to the population fell between 1991 and 1996 (Hunter and Gray 1998). If educational attainment increases the probability of employment by acting as a signal or screening device for employers then the absolute increase but relative decline in indigenous educational attainment will not increase the probability of employment for indigenous cohorts.

This section uses an alternative presentation of the models estimated in this paper to consider how the goal of increasing the employment level of indigenous Australians to that of the rest of society, may be achieved. The marginal effects of changing the levels of education and region of residence so that there is statistical equality between indigenous and non-indigenous populations is presented. That is, Table 3 presents estimated changes in the proportion of indigenous working-age population who would either be non-CDEP scheme workers or participate

in the labour market if they had the same educational and residential characteristics as the non-indigenous population.

The interpretation of Table 3 needs some explanation. The marginal effects are the expected change in employment and participation rates if statistical equality in educational qualifications and region of residence were achieved between the indigenous and non-indigenous populations. Educational attainment is represented solely by the degree variable given the difficulties, detailed above, in getting an accurate estimate of the effect of diplomas for non-indigenous females. The major urban variable is chosen to represent the region of residence because that is where the job markets are most developed and the variation in other regions of residence is captured by the marginal effects reported above.

The most striking feature of Table 3 is the differences in marginal effects when using indigenous as opposed to non-indigenous coefficients. If indigenous people had the same likelihood of securing a job in major urban areas as other Australians, then changing the residential patterns to conform to the Australian average would improve employment outcomes by well over 50 percentage points. However, the demand for indigenous labour in major Australian cities appears to be much lower than for other Australians as the same change in indigenous male residential patterns only generates 10.7 percentage points more employment when indigenous coefficients are used. The same change in indigenous female residential patterns generates 1.8 percentage points less employment when indigenous coefficients are used. Even more important is the fact that the indigenous coefficients used in these calculations are not statistically different from zero. Similarly, the expected increases in participation rates are smaller if the indigenous coefficients are used. The obvious message for policy makers is that simply moving indigenous people to the buoyant job markets in major urban areas is not a panacea for indigenous deficits in labour force status. Other difficult to measure factors, such as unobserved heterogeneity, are likely to be as important as the number of jobs available in an area.

Table 3. Prospects for statistical equality in employment and labour force participation, fixed effects estimates

	Males		Females	
	Indigenous coefficients	Non-indigenous coefficients	Indigenous coefficients	Non-indigenous coefficients
Probability of employment				
Major urban	10.7	73.4*	-1.8	44.2*
Degree	0.3	13.0*	-4.2	31.5*
Probability of participating in the labour force				
Major urban	7.5	83.6*	2.5	47.0*
Degree	-3.0	-2.4	-5.6	28.5*

Notes: * signifies that the underlying regression coefficient is statistically significant.

The marginal effect for a variable is calculated as the difference in the predicted probability of employment or participation when statistical equality is achieved for education and region of residence. Statistical equality constitutes raising indigenous characteristics to the level among non-indigenous males and females. Note that the indigenous and non-indigenous coefficients columns are based on the respective coefficients in Appendixes B and C.

Sources: Calculations based on Appendix Tables B1, B2, C1 and C2.

It is important to remember that the marginal effects are based on FE coefficients and therefore do not include the effects of schooling quality and discrimination. In a sense, the indigenous coefficients form a lower bound of the effect of schooling and residence on indigenous people. The prospective improvements in employment and participation rates from achieving statistical equality are again only significant and substantial if the non-indigenous coefficients are used. Therefore, it is likely that school quality, discrimination or other unobserved heterogeneity will need to be addressed if significant inroads into indigenous employment and participation are

to be achieved. Unfortunately, the cohort analysis is not refined enough to be able to discern the precise policy required, it merely casts doubt on the more optimistic assessments of gains from education and geographic mobility (Hunter 1997a).

The apparent contradiction between the cross-sectional evidence in NATSIS and the cohort analysis in this paper points to the need for longitudinal data which trace the experience of individual indigenous people after they acquire their formal education. While aggregate data can be used to discern what will happen to indigenous cohorts as educational attainment is improved, it is important to remember that individual indigenous people may benefit substantially from the experience. The cohort analysis is, as pointed out above, a blunt instrument and the results reflect aggregate changes in education, employment and labour market participation. For example, it is quite probable that there may still be substantial gains in employment that can be achieved by focussing on educating indigenous youth.¹² It will be impossible to issue a definitive analysis until longitudinal data based on individuals is collected and analysed. One possible source of longitudinal data is the Department of Employment, Workplace Relations and Small Business's (DEWRSB) longitudinal data on indigenous job seekers collected between 1996 and 1997. While the DEWRSB data collected would provide a useful starting point, the fact that it is only collected for indigenous persons who were registered at the Commonwealth Employment Service limits the scope of the empirical analysis that can be conducted using it.¹³

Policy discussion

It is often asserted that one of the keys to improving indigenous labour market outcomes is increasing the level of formal education of the entire population, especially younger age cohorts (Hunter 1997a). According to this line of argument, formal education leads to increases in the level of skills and productivity of indigenous Australians, which enables them to compete effectively in the labour market. However, while the level of educational attainment among the indigenous population has been increasing, it has also been increasing in the non-indigenous population. In fact, non-indigenous education has been increasing at a faster rate and, consequently, indigenous educational attainment has fallen further behind.

The implications for labour market success of an absolute improvement but a relative decline in indigenous educational outcomes is shaped by the role that increased educational attainment plays in improving labour market outcomes. If education in itself leads to increases in productivity and employability, then we would expect this to translate into absolute improvements in the labour market outcomes (in terms of employment rates and wage levels) of indigenous Australians. Notwithstanding these absolute improvements, we would also expect a decline in employment and wage rates relative to the non-indigenous population.

If there is substantial aggregate unemployment, as is the case in the Australian labour market, and education improves the productivity of workers, then it is more likely that there may be an absolute, as well as relative, decline in indigenous employment outcomes. In such circumstances we would still expect absolute improvements in the wage outcomes of indigenous Australians.

While conventionally it is argued that increased education leads to improved labour market outcomes by increasing individual productivity, an alternative view is that education leads to improved labour market outcomes by providing a signal to employers of a person's innate productivity. Stated in a different way, when an employer is deciding whom to employ for a job, they cannot determine precisely what each applicant's actual productivity will be. The employer therefore has to make some assessment, or educated guess, as to the probable productivity of each applicant. If people who have a higher level of educational attainment have higher innate productivity, then employers may use highest level of education as an indicator of potential productivity. In this case employers are not looking at a person's absolute level of educational attainment, but rather, that person's level of educational attainment relative to that of other applicants.

If education has no effect upon an individual's productivity, then increases in the education levels of a given population will have no effect on the probability of any particular individual being employed *vis-à-vis* any other individual. In addition, it should have no effect on wages. However, if the education level of indigenous Australians increased in absolute terms, but fell relative to the education attainment of non-indigenous Australians, then employers may assume, on the basis of relative educational attainment, that indigenous workers have lower potential productivity. The outcome could well be that indigenous employment rates and wages would fall relative to that of non-indigenous workers and may, in fact, worsen in absolute terms (particularly if there is surplus labour supply). Indeed, Hunter and Gray (1998) point to an absolute and relative decline in employment between 1986 and 1996.

Hunter and Gray (1999) find that for indigenous Australians the attainment of a degree increases the income they receive. This is consistent with the idea that education improves labour market outcomes by increasing productivity as well as acting as a signal or screening device. That is, while education acts as a signalling or screening in gaining employment, it also leads to a higher wage once employed because it increases productivity.

The *Indigenous Employment Policy* seems to be shifting the focus of the tertiary education strategy towards 'picking winners'. For example, the creation of a National Indigenous Cadetship Program provides opportunities for indigenous undergraduates to gain the professional qualifications needed for a range of jobs in both the public and private sectors. As part of the program employers will be assisted to recruit indigenous undergraduates by offering cadetship places.

This analysis suggests that increasing educational attainment for entire cohorts is not in itself a panacea for indigenous labour market outcomes. While it is desirable that the levels of educational attainment of indigenous Australians catch up with those of non-indigenous Australians, this did not happen between 1986 and 1996 (Gray, Hunter and Schwab 1999). This is not to suggest that the absolute increases in educational attainment which have been achieved by indigenous cohorts are not without benefit as evidenced by the effect this has on incomes (Hunter and Gray 1999). However, formal education needs to be combined with a series of other policies aimed at combating indigenous labour market disadvantage (Hunter 1999). A holistic approach to increasing indigenous attachment to the labour market and employment outcomes is likely to be required. Such an approach might include addressing low self-esteem, high arrest rates, inadequate health and poor housing conditions among indigenous people. Unfortunately, while the grouped nature of the cohort analysis prevents any specific policy recommendations, the analysis indirectly points to a possible role for addressing schooling quality and discrimination in employment and participation, as these are likely to be some of the other unidentified factors affecting employment and participation outcomes. Therefore, while education policy is probably still important for improving indigenous labour force outcomes, more attention needs to be paid to the quality of education received. Reforms to the industrial relations system remain the most likely avenue for addressing ongoing problems with racial discrimination in the workplace (Hunter 1997b).

Notes

1. The CDEP scheme is a work-for-the-dole scheme which is described in more detail later in this introductory section.
2. Smith (1994) reports that in Port Lincoln there is a 'no work – no pay' rule which requires participants to present for work sober, to obtain medical certificates if sick, and to have the manager's approval to leave town for periods of time affecting their work participation. Failure to comply with these responsibilities may result in wages being withheld. In addition, policies have been established by the board which administers the scheme to cover occupational health and safety, leave entitlements for sickness, funerals, special leave for the illness of a family member and maternity leave. In addition Smith (1994) finds that the Port Lincoln CDEP scheme involved significant amount of training, both on-the-job and in a more formal setting (for example, a TAFE course).

3. CDEP employment for each cohort is estimated using the Aboriginal and Torres Strait Islander Commission's aggregate administration data on CDEP participation, Taylor and Hunter's (1998) assumption about the proportion of participants who have a job, and information on age distributions from the National Aboriginal and Torres Strait Islander Survey (NATSIS) (mostly categorised by five-year age groups). The NATSIS estimates of the age distribution of CDEP workers is converted into a CDEP employment rate for each cohort using a five-year moving average. The imposition of a fixed age structure on CDEP, based on 1994 data, can easily be justified given that CDEP was relatively insignificant in 1986 and that 1994 was, more or less, a mid-point between 1991 and 1996. While these are the best working assumptions available, it is still possible that subtle variations in the age structure of participants in CDEP will have a small affect on the regression estimates. Sensitivity analysis of including CDEP employment in the analysis indicates that the results are not sensitive to our assumption.
4. For reviews of these issues see Killingsworth (1983) and Hersch and Stratton (1994).
5. The costs of searching for a job include both time costs and direct costs such as transport costs.
6. These statistics are calculated using ABS (1994a), ABS (1994b) and ABS/CAEPR (1996).
7. The indigenous statistic is based on NATSIS data collected in or around June 1994.
8. The models are estimated using minimum χ^2 methods. This involves applying the logit transformation to the dependent variable and then using weighted OLS estimation where the weight is given by the square root of the variance. Formally the logit transformation is $\ln(p_i/(1-p_i))$ which transforms a variable in the range 0 to 1 to the range $-\infty$ to $+\infty$ where p_i is the proportion of group i which is employed (or participating in the labour force). The variance is given by $(1-p_j)/(n_j p_j)$ where n_j is the number of observations in group j .
9. The standard approach in the literature is to parameterise one of the effects. A popular parameterisation is to use the aggregate rate of unemployment instead of the calendar year dummy, arguing that this will pick up the effect of the macroeconomic environment. However, because we are only using data for three points in time it is not possible parameterise the model using the aggregate rate of unemployment.
10. The estimation results are not presented in this paper but are available from the authors on request.
11. The *Indigenous Employment Policy* was released by the Minister for Employment, Workplace Relations and Small Business, Peter Reith, on the 25 May 1999.
12. Gray, Hunter and Schwab (1999) show that a substantial portion of the growth in indigenous, as opposed to non-indigenous, qualifications between 1986 and 1996 is from older adults. This may partially explain the poor returns to indigenous qualifications in the cohort analysis given that aggregate growth in non-CDEP employment was stagnant (Taylor and Hunter 1998).
13. The DEWRSB data are clearly not representative of the indigenous population as a whole as they are a sample taken from the Commonwealth Employment Services (CES) register of unemployed job seekers. This is likely to cause the sample to be unrepresentative of indigenous job seekers for two reasons. First, there is an inherent tendency to over-sample the long-term unemployed in samples taken from a register of unemployed persons. Second, persons who register with the CES were likely to differ from other indigenous job seekers in unobserved ways. Studies of displaced workers in Australia have found that the individuals who have the lowest probabilities of re-employment were those who register with the CES. For a review of this literature see Borland (1998).

Notwithstanding, the last issue may be addressed using appropriate sophisticated techniques. Another issue for the DEWRSB data is that it was not collected over a long period and, therefore, the results of the analysis may not be as robust or as informative as they otherwise might be.

Appendix A

Table A1. Descriptive statistics for regressions

	Male		Female		Persons
	Indigenous	Non-indigenous	Indigenous	Non-indigenous	
Non-CDEP employment	0.434 (0.07)	0.792 (0.13)	0.262 (0.07)	0.564 (0.16)	0.674 (0.19)
Unemployment	0.193 (0.07)	0.078 (0.03)	0.090 (0.03)	0.047 (0.02)	0.064 (0.03)
Participation rate	0.719 (0.12)	0.870 (0.14)	0.426 (0.10)	0.611 (0.17)	0.739 (0.20)
CDEP employment	0.093 (0.04)	0.000 (0.00)	0.074 (0.05)	0.000 (0.00)	0.001 (0.01)
Major urban	0.271 (0.03)	0.636 (0.02)	0.290 (0.03)	0.648 (0.02)	0.637 (0.05)
English difficulty	0.044 (0.02)	0.029 (0.01)	0.046 (0.03)	0.038 (0.01)	0.034 (0.01)
Degree	0.026 (0.02)	0.134 (0.04)	0.042 (0.02)	0.130 (0.06)	0.130 (0.05)
Diploma	0.244 (0.02)	0.380 (0.02)	0.183 (0.03)	0.241 (0.03)	0.309 (0.08)
Widowed/divorced/ separated	0.291 (0.24)	0.319 (0.34)	0.355 (0.22)	0.373 (0.33)	0.346 (0.33)
Married	0.259 (0.23)	0.435 (0.36)	0.277 (0.22)	0.459 (0.34)	0.445 (0.35)
Age	36.4 (11.1)	40.5 (12.0)	36.5 (11.2)	40.5 (12.0)	40.5 (12.0)
Left school aged 14 or less	0.232 (0.12)	0.148 (0.13)	0.191 (0.11)	0.141 (0.13)	0.145 (0.13)
Left school aged 17 or more	0.187 (0.09)	0.380 (0.13)	0.198 (0.11)	0.351 (0.16)	0.363 (0.15)

Notes: Standard deviations are in brackets. The descriptive statistics are calculated for the population aged 22 to 64 years. For example, the unemployment statistic reported is not the unemployment rate, but rather the proportion of the working-age group who are unemployed.

Source: 1986, 1991 and 1996 Censuses.

Appendix B

Table B1. Estimates of the probability of non-CDEP employment, males

	Indigenous		Non-indigenous	
	OLS	FE	OLS	FE
Age	0.181 (8.60)**	0.144 (6.27)**	0.356 (15.58)**	0.063 (1.81)
Age squared	-0.00221 (11.13)**	-0.00231 (10.29)**	-0.00441 (15.05)**	-0.00191 (7.52)**
Major urban	1.549 (2.68)**	1.239 (1.63)	0.717 (0.35)	13.189 (6.97)**
Difficulty in speaking English	-2.307 (3.13)**	-2.196 (1.67)	2.064 (0.72)	-36.642 (8.60)**
Degree	0.119 (0.14)	0.104 (0.09)	1.266 (0.90)	6.591 (3.03)**
Diploma	-0.450 (0.82)	-0.034 (0.05)	-2.726 (1.97)*	-1.943 (0.98)
Widowed, divorced or separated	-0.386 (1.33)	-0.699 (1.59)	-1.191 (3.54)**	1.230 (4.42)**
Married	-0.570 (1.88)	-1.030 (2.54)*	-0.766 (2.43)*	0.973 (3.85)**
Left school aged 14 years or less	0.540 (1.95)		-2.263 (4.01)**	
Left school aged 17 years or more	0.900 (2.22)*		-2.477 (3.95)**	
1986	0.474 (5.40)**		0.207 (1.57)	
1991	0.180 (2.47)*		-0.177 (1.89)	
Constant	-4.079 (9.10)**	-0.339 (0.50)	-2.759 (1.52)	-8.178 (5.38)**
Observations	131	131	131	131
R-squared	0.9262	0.9600	0.9835	0.9969

Notes: Absolute value of t-statistics are in parentheses; * significant at 5 per cent level; ** significant at 1 per cent level.

Table B2. Estimates of the probability of non-CDEP employment, females

	Indigenous		Non-indigenous	
	OLS	FE	OLS	FE
Age	0.187 (4.23)**	0.502 (10.42)**	0.380 (20.20)**	-0.062 (1.00)
Age squared	-0.00254 (6.48)**	-0.00504 (11.89)**	-0.00424 (21.24)**	-0.00210 (9.22)**
Major urban	3.892 (3.76)**	-0.312 (0.20)	3.438 (2.33)*	7.335 (3.97)**
Difficulty in speaking English	-2.364 (1.99)*	-4.200 (2.05)*	-14.277 (5.79)**	-15.308 (3.59)**
Degree	5.393 (3.08)**	-3.020 (1.45)	2.937 (2.43)*	17.673 (7.94)**
Diploma	-0.032 (0.03)	-2.210 (1.88)	-7.634 (3.77)**	-12.528 (4.62)**
Widowed, divorced or separated	0.014 (0.02)	-8.872 (8.83)**	-3.394 (11.91)**	-3.274 (10.12)**
Married	-1.417 (2.18)*	-8.111 (8.93)**	-3.778 (12.95)**	-4.047 (14.80)**
Left school aged 14 years or less	2.056 (3.60)**		-4.814 (9.65)**	
Left school aged 17 years or more	0.498 (0.72)		-3.583 (6.12)**	
1986	1.032 (5.57)**		0.885 (4.61)**	
1991	1.008 (6.95)**		0.498 (4.29)**	
Constant	-6.130 (8.15)**	-5.818 (4.70)**	-3.293 (2.50)*	12.641 (2.83)*
Observations	131	131	131	131
R-squared	0.8314	0.9217	0.9784	0.9956

Notes: Absolute value of t-statistics are in parentheses; * significant at 5 per cent level; ** significant at 1 per cent level.

Appendix C

Table C1. Estimates of the probability of participation in the labour force, males

	Indigenous		Non-indigenous	
	OLS	FE	OLS	FE
Age	0.141 (6.70)**	0.132 (4.71)**	0.341 (10.71)**	0.118 (1.82)**
Age squared	-0.00207	-0.00204	-0.00466	-
				0.00171
Major urban	(10.61)** 0.855 (1.45)	(7.53)** 1.086 (1.15)	(11.92)** -0.871 (0.32)	(3.65)** 17.945 (5.48)**
Difficulty in speaking English	-3.304 (4.72)**	-2.322 (1.51)	3.199 (0.85)	-26.987 (3.69)**
Degree	-0.946 (1.07)	-1.348 (0.99)	0.914 (0.46)	-2.210 (0.55)
Diploma	-0.200 (0.36)	-0.733 (0.79)	-2.536 (1.32)	1.000 (0.28)
Widowed, divorced or separated	-0.088 (0.30)	-0.967 (1.74)	-0.864 (1.79)	1.087 (2.05)*
Married	-0.549 (1.76)	-0.729 (1.42)	-0.795 (1.73)	1.482 (3.07)**
Left school aged 14 years or less	0.316 (1.10)		-1.639 (2.23)*	
Left school aged 17 years or more	0.717 (1.69)		-2.595 (3.00)**	
1986	0.466 (5.04)**		0.396 (2.15)*	
1991	0.411 (5.38)**		0.236 (1.75)	
Constant	-1.440 (3.20)**	-0.742 (1.29)	-0.370 (0.16)	-13.018 (2.94)**
Observations	131	131	131	131
R-squared	0.9771	0.9818	0.9856	0.9960

Notes: Absolute value of t-statistics are in parentheses; * significant at 5 per cent level; ** significant at 1 per cent level.

Table C2. Estimates of the probability of participation in the labour force, females

	Indigenous		Non-indigenous	
	OLS	FE	OLS	FE
Age	0.129 (3.04)**	0.464 (10.15)**	0.420 (21.75)**	0.016 (0.25)
Age squared	-0.00203 (5.50)**	-0.00443 (11.31)**	-0.00465 (22.95)**	-0.00271 (11.16)**
Major urban	2.737 (2.73)**	0.322 (0.21)	2.833 (1.89)	7.468 (3.90)**
Difficulty in speaking English	-2.148 (1.90)	-2.223 (1.12)	-15.379 (6.19)**	-13.702 (3.11)**
Degree	5.388 (3.23)**	-3.142 (1.61)	2.492 (1.96)*	15.118 (6.38)**
Diploma	0.128 (0.12)	-2.266 (2.00)*	-6.667 (3.26)**	-13.174 (4.71)**
Widowed, divorced or separated	-0.174 (0.23)	-8.273 (8.60)**	-4.131 (14.07)**	-4.326 (12.64)**
Married	-1.504 (2.42)**	-7.774 (8.99)**	-4.762 (15.76)**	-4.948 (17.07)**
Left school aged 14 years or less	1.974 (3.61)**		-5.175 (10.30)**	
Left school aged 17 years or more	-0.642 (0.98)		-3.661 (6.02)**	
1986	0.442 (2.60)**		0.997 (5.07)**	
1991	0.661 (5.05)**		0.706 (5.82)**	
Constant	-3.089 (4.40)**	-6.164 (5.31)**	-3.022 (2.26)*	11.118 (2.41)*
Observations	131	131	131	131
R-squared	0.8854	0.9470	0.9831	0.9963

Notes: Absolute value of t-statistics are in parentheses * significant at 5 per cent level; ** significant at 1 per cent level.

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