



The effect of arrest on Indigenous employment prospects

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The effects of criminal conviction on an individual's employment prospects are a matter of policy significance, especially for Australian Aboriginals who are overrepresented both among the unemployed and among those who come before the criminal justice system. In this study the effect of arrest on the employment status of indigenous Australians is examined using data from the 1994 National Aboriginal and Torres Strait Islander Survey. Having been arrested is found to significantly reduce the probability of indigenous employment by 18.3 and 13.1 percentage points for males and females respectively. The effect also varies according to the reason for a person's most recent arrest. Differences in arrest rates between indigenous and non-indigenous Australians may explain about 15 per cent of the difference in the level of employment between those groups. Promoting diversion options should be a priority for governments keen to break the nexus between indigenous unemployment and crime.

INTRODUCTION

Criminologists have long been interested in the relationship between unemployment and crime but have historically spent much more time examining the effect of unemployment on criminal behaviour than the effect of a criminal conviction on an individual's employment prospects. This second issue is particularly salient for Australian Aboriginals who are overrepresented among both the unemployed and those who have been arrested.

Preliminary analysis of the 1994 National Aboriginal and Torres Strait Islander Survey (NATSIS) indicates that arrest is one of the major factors underlying the poor employment prospects of the indigenous population (Australian Bureau of Statistics 1996a; Hunter 1997).

Unfortunately, these early studies could not determine the direction of causality between arrest and employment. This bulletin reports on the results of a statistical analysis which examines how having an arrest history affects an Australian Aboriginal's employment status. The bulletin provides an overview of a detailed study conducted by the authors. For further details of the analysis

and results the reader is referred to the full report (Borland & Hunter 1999).

There are a number of reasons why linkages might exist between arrest or crime and employment. Arrest may affect a person's employment outcome. A person who has been arrested and/or convicted of an offence may be stigmatised by employers and hence be less likely to obtain employment. Alternatively, employers may be deterred from locating in regions with high levels of criminal activity and hence there may be limited employment opportunities for persons living in those regions. There are other possibilities as well. Contact with the criminal justice system may affect a person's motivation to work, or perceptions of the expected benefits from seeking employment, and hence lower the probability of employment.

It is important to bear in mind, though, that, not only can a person's arrest history affect the likelihood of being employed, a person's employment outcome may also affect the likelihood of being arrested. For example, a response to being unable to obtain employment may be to engage in drinking which increases the probability of being arrested for offences relating to drunkenness.

The potential effect of arrest on employment outcomes of indigenous Australians is of interest for a number of reasons. First, it may be important for understanding differences in employment outcomes between indigenous and other Australians. Arrest rates for indigenous Australians are significantly greater than for other Australians – for example, in 1994 indigenous Australians comprised 2.6 per cent of the population in Western Australia yet accounted for 20.2 per cent of total arrests (Broadhurst 1997, p. 426). Hence, if having been arrested has a negative effect on a person's probability of employment, the disparity in arrest rates may explain part of the difference in employment outcomes between indigenous and other Australians.

Second, understanding the relationship between an individual's arrest record and employment outcome provides an insight into the social costs of contact with the criminal justice system for indigenous Australians. This seems particularly important where there is a possibility that much of this contact for indigenous Australians arises from differential treatment of indigenous and non-indigenous Australians rather than

differences in behaviour (see, for example, Gallagher & Poletti 1998).

In this bulletin we use data from the NATSIS to examine the determinants of employment outcomes for indigenous Australians. The NATSIS was undertaken by the Australian Bureau of Statistics (ABS) in April to July 1994 in response to a recommendation by the Royal Commission into Aboriginal Deaths in Custody (Commonwealth of Australia 1991). The NATSIS covered a total of 4,205 households, which yielded 15,726 indigenous respondents, 3,076 non-indigenous persons living in the same household as an indigenous person and 158 prisoners (Australian Bureau of Statistics 1996b). For our analysis a restricted sample was selected from the NATSIS. First, only working-age members of the population (15-64 years) who were not in full-time schooling were included. Second, persons who were in prison at the time of the survey were excluded; this group represented 1.8 per cent of the total sample population. There were 8,402 respondents in this restricted sample. The sample was further reduced to 7,568 persons after deleting observations that did not have a complete record of all the information required for the analysis.

LABOUR FORCE CHARACTERISTICS AND HIGH INDIGENOUS ARREST RATES

We begin with some descriptive information on employment and arrest experience for the indigenous population.

Table 1 shows the aggregate employment/population rate,³ and the employment/population rate disaggregated by arrest record and by type of employment – in Community Development Employment Projects (CDEP) employment and in non-CDEP employment. The CDEP scheme is a Commonwealth government program under which unemployed indigenous persons of working age forego individual entitlements to unemployment benefit payments in return for a grant to their local community council which is used to fund job creation in community development activities.⁴

Table 1 shows that the employment/population rate is lower for persons who had been arrested than for persons who had not been arrested in the five years prior to the survey. It is also evident that this pattern in aggregate employment is solely due to the fact that those with an arrest record are much less likely to be found in non-CDEP employment.

Table 2 presents information on the proportions of the indigenous population arrested in the last five years by selected characteristics. The table shows that 33.3 per cent of males, and 11.2 per cent of females, had been arrested in the last five years. For those arrested the average number of arrests is 3.0 for males and 2.2 for females. Generally, males in younger age groups and with lower levels of educational attainment have the highest incidence of arrest. There does not appear to be any pattern in the incidence of arrest for persons living in different regions.

Table 3 shows the reasons for the most recent arrest. The most common reasons for arrest relate to drinking – 23.1 per cent of males and 6.6 per cent of females had charges for drink driving or drinking in public in their most recent arrest in the previous five years. Theft is a relatively minor component of indigenous arrests. Given that theft is the only category of indigenous arrest for which there may be a pecuniary incentive, the preponderance of indigenous arrests are not for offences committed for financial gain.

DESCRIBING EMPLOYMENT IN THE CONTEXT OF HIGH ARREST RATES

The aim of our analysis is to determine the effect of an arrest history on an Australian Aboriginal's chances of being employed. One issue which arises in analysing arrest data from a self-response survey is the possibility of under-reporting of arrest. For example, Freeman (1994, p. 16) notes that it is common to find under-reporting of crime in the United States by black youths. To examine potential under-reporting of arrest by indigenous Australians we are restricted to a comparison between NATSIS data and official police data for Western Australia as this is the only State which reports official police arrest data disaggregated by indigenous and non-indigenous persons. Estimates based on the official police data indicate that the proportion of indigenous persons arrested in Western Australia between

Table 1: Labour force status by whether arrested in past five years, Indigenous Australians aged 15-64, 1994

<i>Employment status</i>	<i>Males</i>		<i>Females</i>	
	<i>Not arrested (%)</i>	<i>Arrested (%)</i>	<i>Not arrested (%)</i>	<i>Arrested (%)</i>
Employed-total	55.5	40.9	31.3	22.5
CDEP	19.2	21.5	9.6	10.9
non-CDEP	36.3	19.4	21.7	11.6
Unemployed	23.0	39.4	15.7	32.3
Not in labour force	21.5	19.7	53.0	45.2
Total	100.0	100.0	100.0	100.0
Number of observations	2,628	1,217	4,071	486

Source: NATSIS, unit record file.

Table 2: Arrests in last five years by selected characteristics, Indigenous Australians aged 15-64, 1994

Characteristics	Males		Females	
	Proportion arrested (%)	Average number of arrests	Proportion arrested (%)	Average number of arrests
Overall	33.3	3.0	11.2	2.2
Age:				
15 to 24	40.6	3.2	13.6	2.5
25 to 44	37.0	2.8	12.3	2.1
45 to 64	15.0	2.9	4.7	1.7
Education:				
Degree / diploma	17.9	4.1	6.5	2.0
Vocational qualifications	34.3	2.5	11.6	1.8
Completed Year 12	20.3	2.1	7.9	2.5
Left school Years 10 to 11	34.9	2.8	10.7	1.9
Left school Years 6 to 9	36.1	3.2	13.3	2.3
Left school in Year 6 or below	23.4	2.9	6.5	2.8
Region of residence:				
Capital city	36.1	2.9	16.1	2.3
Other urban	35.4	3.1	11.9	2.1
Rural	27.5	2.8	7.5	2.3
Remote	32.4	2.9	9.8	2.3

Note: Average number of arrests is for the subset of persons arrested in the previous five years. Persons with 10 or more arrests were assumed to have 10 arrests.

Source: NATSIS, unit record file.

1990 and 1994 was 24.6 per cent.⁵ Data from NATSIS show that 25.4 per cent of the indigenous population in Western Australia in 1994 had been arrested in the previous five years (Australian Bureau of Statistics 1995, Table 51). The closeness of the estimates of the proportion of the indigenous population arrested for Western Australia from the NATSIS and official police data gives us some confidence that, at least at an aggregate level, under-reporting of arrest is not a serious problem.

METHOD OF ANALYSIS

To examine the effect of arrest on employment we use a multiple regression model to predict employment, using arrest and other relevant variables as predictors. However, in analysing the data we first need to take account of (1) the fact that a person's employment status may have an effect on the likelihood of being arrested (as well as an arrest record affecting employment i.e. the causal direction may flow both ways) and (2) the fact that unobserved variables may be responsible for the relationship between arrest and

Table 3: Reasons for most recent arrest in last five years, Indigenous Australians aged 15-64, 1994

Reason for most recent arrest	Percentage of population	
	Males	Females
Drink driving	10.7	1.9
Drinking in public	12.4	4.7
Outstanding warrant	6.2	1.5
Assault	6.3	2.1
Theft	4.9	1.0

Source: NATSIS unit record file.

employment. The Appendix describes the method of analysis for dealing with these possibilities. It is sufficient to note here that the analysis shows no evidence of any bias in our estimates of employment induced by an effect of employment on arrest or of any effects from unobserved variables. The effect of arrest on employment can therefore be assessed using a single-equation multiple regression model to predict employment.

Employment is measured as the employment status of the respondent at the time of the survey. One important

issue in measuring employment status is whether to include persons working under the CDEP scheme as employed or not employed. Our objective is to characterise the determinants of employment status in an environment where direct government intervention through job creation schemes is absent. Since employment under the CDEP scheme is generally regarded as a substitute for receipt of unemployment benefit payments, we classify persons employed under the CDEP scheme as not employed.⁶

A number of data items from the NATSIS were used as explanatory variables to predict employment. Individuals' observed employment outcomes depend on the interaction of labour demand and labour supply factors. Hence we seek to include, as explanatory variables for employment, a range of factors that are likely to capture the effects of both labour demand and labour supply on employment. These factors can be classified as four main types of variables: skill, location, family, and socioeconomic. To capture skill factors, the following variables were included:

- age (15-24, 25-44, and 45-64 years);
- years completed at high school;
- post-school qualification (degree/diploma, vocational qualification, other, or none);
- whether or not a training course was completed in the previous year;
- whether or not respondent has difficulty in speaking English.

Locational determinants of employment status are proxied for by region of residence (capital city, other urban, rural, or remote). Family-type variables included as predictors of employment are variables for whether the respondent is married, lives in a mixed family (that is, with indigenous and non-indigenous members), and the number of children in the family. Possible socioeconomic or social influences on employment status are represented by variables for whether the respondent voted in any recent election, has a long-term health condition, and is a Torres Strait Islander.

Arrest is also included as an explanatory variable for employment. For this purpose we use two alternative ways of measuring arrest – one as a variable for whether a person had been arrested in the five years and the other as a series of variables for whether a person's most recent arrest involved charges for drinking offences, theft, assault, or an outstanding warrant.

RESULTS

OVERALL EFFECT OF ARREST ON INDIGENOUS PEOPLE'S EMPLOYMENT PROSPECTS

The results show that even after controlling for skill, location, family and socioeconomic factors there is a

significant relationship between a person's arrest record and employment status. This suggests that the effect of arrest on employment is not simply a proxy for a wider set of social influences.

A wide range of factors is found to affect a person's employment outcome. As well as establishing the existence of a significant negative relationship between arrest and employment status, the probability of employment is found to be lower for younger and older age groups, for persons with low levels of educational attainment and training, with difficulty in speaking English, and higher for persons who were married, had voted in a recent election, or were living in a mixed family.

Estimates of the marginal effect on the probability of employment are presented in Table 4 for several regressors. The table shows the estimated marginal effects, on the probability of being employed, measured relative to a hypothetical reference person. The hypothetical reference person, or so-called 'base case', is taken to be an Australian Aboriginal, who:

- is aged 25-44;
- lives in an urban region outside a capital city;
- did not complete a training course in the previous 12 months;
- has no difficulty in speaking English;
- left school in Years 6 to 9;
- has no post-school qualification;
- is not married;
- voted in a recent Federal, State or ATSIC election;
- is not living in a racially mixed family; and
- does not have long-term health condition.

For females the base case was also a woman with no children. The base case is intended to represent a 'representative' member of the indigenous population – and hence was chosen using sample information on the most likely outcome for each explanatory variable.⁷ The probability of being in non-CDEP employment for the base case is 0.410 and 0.291 for males and females, respectively.

The results show that having been arrested has a significant effect on the

probability of employment. For males having been arrested reduces the probability of employment from about 0.410 to 0.227 (a decrease of 0.183); and for females the probability of employment falls from about 0.291 to 0.160 (a decrease of 0.131). Both marginal effects are statistically significant.

The size of the effect of indigenous arrest is large relative to other factors that determine employment. For males, arrest is the third largest influence on employment behind education and living in a family which includes non-indigenous people. For example, completing a qualification for males increases the probability of employment by between 17.1 and 25.1 percentage points. That is, arrest is almost as important as education, at least for indigenous males, in explaining employment.

DIFFERENCES BETWEEN INDIGENOUS AND NON-INDIGENOUS EMPLOYMENT

What are the implications of the effect of arrest on employment status for understanding differences in employment outcomes between indigenous and non-indigenous Australians? Since arrest rates are substantially lower for non-indigenous than for indigenous Australians it might be expected that the negative effect of arrest on employment would provide some explanation for why employment/population rates of indigenous Australians are lower than those of non-indigenous Australians.

One approach to estimating the size of this effect is to multiply the difference in arrest rates between indigenous and non-indigenous Australians by the effect of arrest on the probability of employment. To undertake this exercise we use data on the difference in arrest rates between indigenous and non-indigenous persons between 1990 and 1994 from Western Australia (Ferrante & Loh 1996, p. 39), and estimates of the effect of arrest on employment from the regression analysis in this paper. As data on arrest rates of indigenous and non-indigenous Australians are not available disaggregated by gender the analysis is restricted to total persons.

Based on estimates reported earlier in the paper, the proportion of indigenous

Table 4. Marginal effect of a change in the circumstance of the base case on probability of non-CDEP employment, Indigenous Australians aged 15-64, 1994

<i>Change from the base case:</i>	<i>Males</i>		<i>Females</i>	
	<i>Change in probability of employment</i>	<i>Standard error</i>	<i>Change in probability of employment</i>	<i>Standard error</i>
Arrested	-0.183*	0.019	-0.131*	0.025
Age 15 to 24	-0.109*	0.023	-0.110*	0.019
Age 45 to 64	-0.034	0.027	-0.060*	0.025
Torres Strait Islander	-0.062	0.035	-0.020	0.031
Living in capital city	0.078*	0.031	-0.015	0.024
Living in rural area	-0.049	0.025	-0.054*	0.022
Living in remote area	-0.140*	0.024	-0.060*	0.022
Difficulty in English	-0.095*	0.028	-0.087*	0.024
Completed training course	0.113*	0.038	0.176*	0.040
Left school before Year 6	-0.094*	0.034	-0.045	0.033
Left school in Year 10 or 11	0.073*	0.022	0.106	0.021
Completed Year 12	0.150*	0.039	0.229*	0.034
Degree / diploma and completed Year 12	0.171*	0.056	0.255*	0.035
Vocational qualification	0.251*	0.030	0.170*	0.033
Other qualification	0.192*	0.040	0.169*	0.041
Married	0.102*	0.020	0.004	0.018
Did not vote in recent election	-0.090*	0.022	-0.125*	0.020
Living in a racially mixed family	0.210*	0.024	0.138*	0.023
Long-term health condition	-0.026	0.021	-0.033	0.017
One child under 12			-0.068*	0.020
Two / three children under 12			-0.140*	0.020
Four plus children under 12			-0.175*	0.026

Note: Asterisk denotes significance at the 5 per cent level.

persons arrested between 1990 and 1994 is taken as 24.6 per cent. For the proportion of non-indigenous persons arrested in the same period, we take an upper bound estimate of 8.5 per cent and a lower bound estimate of 2.6 per cent.⁸ The marginal effect of arrest is assumed to be to reduce the probability of employment by 15 percentage points. This is approximately equal to the average of the marginal effects of arrest on employment for males and females.

It can be shown that an estimate of the effect of a reduction in indigenous arrest on employment can be obtained by multiplying the hypothesised reduction in

the incidence of arrest by the marginal effect of arrest. For example, if the indigenous arrest rate was reduced to that of other Australians, then the indigenous employment/population rate would increase by between 3.3 and 2.4 percentage points (depending on whether non-indigenous arrest rate is assumed to equal the lower or upper bounds given above). As the difference in the employment/population rate between these groups in 1994 was 19.5 percentage points,⁹ the effect of arrest accounts for between 12 and 17 per cent of the difference in employment/population rates between indigenous and non-indigenous Australians in 1994.

TYPE OF ARREST AND INDIGENOUS EMPLOYMENT OUTCOMES

How does each type of arrest affect employment outcomes? Table 5 presents the marginal effect of type of arrest on the probability of employment for the base case scenario.¹⁰ The probabilities of being in non-CDEP employment for the base case for the Table 5 model are 0.384 and 0.287, for males and females, respectively. For both males and females there are significant reductions in the probability of employment where a person's most recent arrest involved charges for drinking-related offences or was for an outstanding warrant. Arrest for theft has

Table 5: Effect on probability of employment of arrest record by reason for last arrest, Indigenous Australians aged 15-64, 1994

<i>Reason for last arrest</i>	<i>Males</i>		<i>Females</i>	
	<i>Change in probability of employment</i>	<i>Standard error</i>	<i>Change in probability of employment</i>	<i>Standard error</i>
Drinking related offence	-0.120*	0.023	-0.137*	0.033
Theft	-0.084	0.050	-0.170*	0.073
Assault	-0.105*	0.040	-0.070	0.059
Outstanding warrant	-0.140*	0.042	-0.190*	0.064

Note: Asterisk denotes significant at the 5 per cent level.

no significant effect on the probability of employment for males, although it does for females, and arrest for assault significantly reduces the probability of employment only for males.

There are a number of potential explanations for why the effect of arrest on employment might differ depending on the reason for most recent arrest. One possibility is that the variables for the reason for arrest are a proxy for the number of arrests in the employment equation. For example, it might be thought that being arrested on an outstanding warrant makes it more likely that a persons will have been arrested on multiple occasions and that this explains the large size of the effect on employment of having been arrested on an outstanding warrant. However, analysis of the number of arrests by reason for last arrest revealed that there was no difference in the number of arrests in each arrest category.

Another possibility is that each type of arrest is treated differently by employers when choosing which potential worker to hire or has a different effect on an individual's motivation to seek employment. It is difficult to see, however, why an employer would not take into account an arrest for theft but would take into account arrest for drinking-related offences. A more likely scenario is that arrest for drinking-related offences indicates that an individual is in an environment where lack of employment opportunities or social conditions reduces the perceived returns to seeking employment.

CONCLUDING REMARKS

The major conclusion of this study is that the experience of arrest rather than any unobservable characteristics of those arrested is driving the relationship between arrest and employment. That is, our analysis indicates that it is not possible to claim that low marketable 'ability' among certain NATSIS respondents both circumscribes their employment prospects and explains their higher arrest rates. The analysis provides a strong empirical and theoretical justification for the policy recommendations of the Royal Commission into Aboriginal Deaths in Custody (Commonwealth of Australia 1991). In particular, ensuring that indigenous citizens are dealt with in ways which minimise contact with the formal criminal justice system should be a priority policy issue for governments who are concerned about indigenous employment outcomes.

This study has also provided a number of new insights into the determinants of employment for indigenous Australians. First, we find that a wide variety of factors are related to employment outcomes. In addition to explanatory variables that seek to capture skill, location or family differences between individuals, it is also found that a set of socioeconomic variables are significant determinants of employment. Second, we find that persons who have been arrested have a significantly lower probability of employment – 13.1 percentage points lower for females and 18.3 percentage points lower for males. On the basis of these estimates it is calculated that differences in arrest rates between

indigenous and non-indigenous Australians could account for about 15 per cent of the difference in employment outcomes between these groups. Third, we find that the effect of arrest on employment differs by reason for most recent arrest.

The findings of the study resonate with the recommendations of the Royal Commission into Aboriginal Deaths in Custody. For example, recommendation 62 indicates that:

[T]here is an urgent need for governments and Aboriginal organisations to negotiate together to devise strategies designed to reduce the rate at which Aboriginal juveniles are involved in the welfare and criminal justice systems and, in particular, to reduce the rate at which Aboriginal juveniles are separated from their families and communities, whether being declared in need of care, detained, imprisoned or otherwise. (Commonwealth of Australia 1991, p. 83.)

The preponderance of alcohol-related offences in the indigenous population also emphasises the direct benefits of decriminalising drunkenness (Commonwealth of Australia 1991, pp. 87-88). While the majority of States had decriminalised public drunkenness before 1990 (Commonwealth of Australia 1992, pp. 279-280), the results indicate that substantial economic gains can still be made by addressing problems relating to the policing of statutes relating to disorderly conduct or drinking in public. An alternative strategy, nominally supported by all State and Federal governments in their responses to the Royal Commission in Aboriginal Deaths

in Custody (Commonwealth of Australia 1992, pp. 281-284), is to ensure ongoing funding and maintenance of adequate non-custodial facilities for the care and treatment of intoxicated persons.

The importance of general socioeconomic and family factors in determining employment outcomes has general implications for employment studies in the population at large. For example, the significance of the socioeconomic indicators, such as whether a person voted in a recent election, means that labour economists should consider controlling for such factors, where possible, as a matter of course.

The economic and social costs of low rates of employment for indigenous Australians are significant and represent a major problem for policy-makers in Australia. Direct labour market intervention is frequently advocated as a solution for poor indigenous employment outcomes. The analysis in this bulletin suggests that it will also be necessary to address the social environment in which individuals make decisions about labour supply and labour demand – and in particular, to address the problem of the high arrest rates among indigenous Australians.

APPENDIX

There are two issues to address in the data analysis. The first is that not only is it possible for a person's arrest history to affect the person's employment, it is also possible that a person's employment status might affect the person's chances of being arrested (in other words, the causal relationship can go in both directions). The second issue to consider is that the observed relationship between arrest and employment may be driven by a third factor that is not adequately captured by the data. For example, unmeasured regional variations in outcomes, arising from the failure to include a State indicator in the NATSIS unit record data, may bias the estimated relationship between arrest and employment. Other factors that are intrinsically difficult to measure, such as 'ability', may also induce the appearance of a relationship.

To resolve these issues we first fit a model to predict arrest (that is, whether or not a person had been arrested in the five

years prior to the NATSIS) using a number of explanatory variables. The explanatory variables included as predictors of arrest are the same set of variables used to predict employment plus two extra variables, namely, whether the respondent had ever drunk alcohol and whether the respondent was taken from his or her natural family. Members of the 'stolen generation' who were taken from their natural families have experienced social dislocation and alienation which anecdotal evidence suggests has significantly increased contact with the criminal justice system (Commonwealth of Australia 1997, pp. 12-16).

In considering explanatory variables for the arrest outcome we note that the arrest record variable represents a summary of arrest outcomes in previous time periods and hence it is actually a function of the lagged values of explanatory variables (because, for example, an arrest four years prior to the survey date would be predicted by explanatory variables at that time). Unfortunately, information on explanatory variables in previous time periods is not available from the NATSIS so that it is necessary to include explanatory variables from the current time period as proxies for effects from previous time periods.

For some variables which are relatively 'permanent', such as age, educational attainment, whether a person was taken from their natural family, and whether they drink alcohol, use of current period variables should not cause a significant loss of information. On the other hand, high rates of geographic mobility in the indigenous population are likely to mean that variables related to current location may be less accurate as proxies for previous location.

It should be noted though that the primary objective in fitting a regression model to predict arrest is to control for unobserved characteristics of the NATSIS respondents, rather than to seek to interpret the coefficient estimates in that regression or to explain arrest outcomes. To undertake the latter task of explaining arrest outcomes it would be necessary to take proper account of the wide range of theoretical work on the determinants of criminal activity (Broadhurst 1997, pp. 413-415).

To allow for an effect of employment on arrest we would like to include employment as a predictor for arrest.

However, the nature of the data do not allow us to predict arrest from the employment variable because employment is measured at the time of the survey whereas arrest is based on what has occurred in the five years prior to the survey. Therefore to predict arrest we can only use proxy measures of prior employment status, and, as already discussed, we have to rely on current social and demographic measures to act as proxy measures of these variables over the previous five years.

The model for arrest therefore includes the same explanatory variables as are to be used to predict employment (plus two additional explanatory variables, as discussed above). This model does not only provide estimates of the effects of the measured explanatory variables. The effects of other unobserved variables on arrest can be estimated from the unexplained variation in the fitted arrest model. The generalised residual from this fitted model measures the unexplained variation and can therefore be regarded as a variable capturing the effects on arrest of all explanatory variables not specifically included in the model.

The next step is to fit a model to predict employment (that is, whether or not a person was employed at the time of the NATSIS). The explanatory variables in the employment model include the economic and social characteristics described above, as well as arrest and the generalised residual from the arrest model. The model for employment therefore includes as an explanatory variable a measure of the effects of all other unobserved variables which affect arrest.

This two-stage process, first fitting a model for arrest, then using information from it to fit a model for employment, deals with our two issues of concern. Using the predictors of employment as explanatory variables in the arrest model accounts for the effect of prior employment status on arrest, and using the generalised residual from the arrest model as a predictor in the employment model accounts for the effects of unobserved variables.

The generalised residual term was not significant in any of the employment regressions analysed for this bulletin. Therefore (1) the potential bias (resulting from arrest depending on employment as well as employment depending on arrest)

is not a significant issue in the data and (2) the unobserved characteristics of people who have been arrested cannot explain the correlation between arrest and employment. This result provides clear evidence that it is the experience of arrest that adversely affects employment prospects for indigenous people.

The final stage of the analysis is to fit a probit regression model to predict employment using both arrest and the social and economic characteristics as predictors, but excluding the generalised residual term.

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NOTES

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- 2 Jeff Borland is Associate Professor in the Department of Economics, University of Melbourne and Visiting Fellow at the Centre for Economic Policy Research, Research School of Social Sciences, The Australian National University, Canberra.
- 3 The employment/population rate is calculated as the number of employed persons of working age divided by the total population of working age, where working age is taken to be 15 to 64. This rate differs from the usual 'participation rate' for which the labour force (those employed or seeking work) is used as the denominator in the rate calculation.
- 4 The CDEP scheme began in 1976/77 with the participation of a single community of 100 persons. By the time of the NATSIS survey, however, the scheme had expanded to 262 communities with over 27,000 participants and accounted for more than 30 per cent of expenditure on indigenous persons.
- 5 Official police data show that in each year from 1990 to 1994 total arrests were 15.9 per cent, 16.9 per cent, 15.9 per cent, 15.6 per cent, and 15.9 per cent of the indigenous population in Western Australia (Ferrante & Loh 1996, p.39). To make the official police data comparable with the NATSIS data it is necessary to convert the annual percentages to an estimate of the proportion of the indigenous population arrested over the previous five years. This calculation is made by summing total arrests as a percentage of the indigenous population across the five-year period from 1990 to 1994 and then adjusting to take account of persons who were arrested multiple times throughout the period. (The adjustment is necessary because, where some persons were arrested more than once over five years, the official police data will over-estimate the proportion of the population who were arrested in that period.) The adjustment uses a measure of the average number of arrests per arrested person over the previous five years in Western Australia derived from the NATSIS data (3.26 arrests).
- 6 Classifying persons employed under the CDEP scheme as non-employed does not involve any judgement about the 'genuineness' of CDEP employment. It simply derives from an assumption that those persons would not be in employment in the absence of government intervention through the CDEP scheme.
- 7 There was one exception. The base case was chosen as a 'not married' person although there were more married respondents than there were single respondents in the sample. (The standard presentation of results in labour market studies is to focus on the effect of marriage.)
- 8 The upper bound estimate is based on the assumption that each person is arrested only once; it equals the total number of non-indigenous arrests as a proportion of the non-indigenous population. The lower bound estimate, which adjusts for the possibility that the same individual is arrested on multiple occasions, equals the total number of non-indigenous arrests as a proportion of the non-indigenous population divided by the estimate of arrests per person in Western Australia from the NATSIS data.
- 9 In 1994 the employment/population rate for indigenous Australians was 35.9% (Australian Bureau of Statistics 1996a) and the employment/population rate for non-indigenous Australians was 55.4% (Australian Bureau of Statistics 1994).
- 10 In order to fit the model for this analysis there was some minor respecification of the model, with some variables omitted. The base case for this model was an Australian Aboriginal who:
 - is aged 25-44;
 - lives in an urban region outside a capital city;
 - has no difficulty in speaking English;
 - left school before Year 9;
 - has no post-school qualification;
 - is not married;
 - voted in a recent Federal, State or ATSI election;
 - does not have long-term health condition.