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Interactions between crime and fertility in the labour supply of Indigenous Australian women

B.H. Hunter and A.E. Daly

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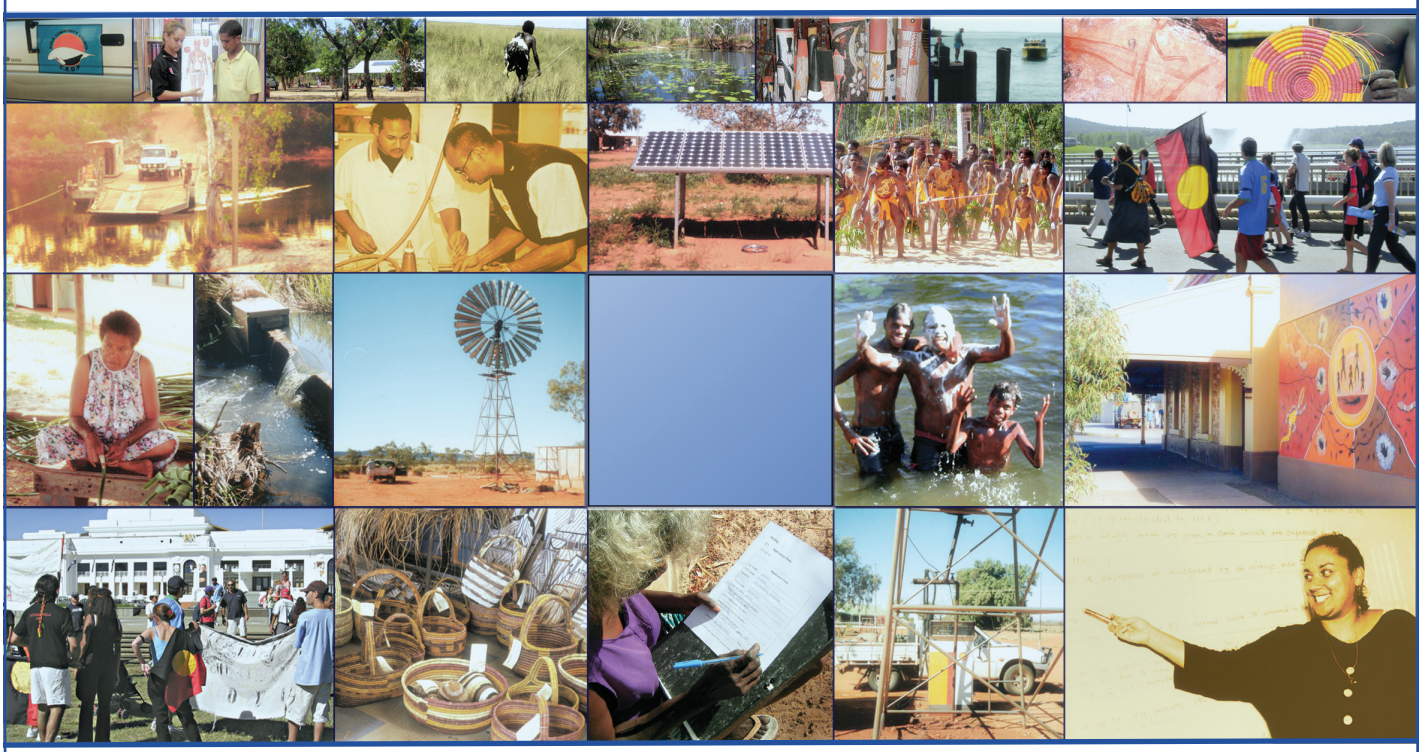

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ABSTRACT

Indigenous Australian females are under-represented in the Australian labour force and in employment. According to the Population Census of 2006, 49 per cent of Indigenous females were in the labour force compared with 58 per cent of other Australian females. The unemployment rate for Indigenous Australian females was almost three times the rate for other Australian females, 15.4 per cent compared with 5.3 per cent. An understanding of the reasons for the poor labour market performance of Indigenous females is an important first step in improving the economic status of this disadvantaged group of Australians. This paper uses data from a survey by the Australian Bureau of Statistics, the National Aboriginal and Torres Strait Islander Social Survey (conducted between August 2002 and April 2003), to consider possible determinants of labour force status for Indigenous females. The survey enables us to use two potentially significant determinants of labour force status that are not available together from other sources—indicators of fertility and the interaction with the criminal justice system. Our estimates show that high levels of fertility and having been arrested have a negative effect on the probability of participation for Indigenous females. The paper concludes with some policy recommendations for raising the level of participation among Indigenous Australian females.

Keywords: Fertility, crime, labour force participation, Indigenous women, econometrics.

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INTRODUCTION

Aboriginal and Torres Strait Islander Australians (hereafter referred to as Indigenous Australians) account for only 2 per cent of the Australian population, but on most of the indicators of economic and social wellbeing they account for a significantly larger proportion of those who are disadvantaged. Employment, income and education levels are lower; child mortality rates and representation in the criminal justice system are higher. The aim of this paper is to look at one of these indicators in greater depth by exploring the determinants of labour supply for Indigenous Australian females.[1]

Census data show that labour force participation (LPF) among Indigenous females has consistently remained below that of other Australian females (Daly 1995; Hunter 2004); although there was a doubling between 1971 and 2006 when 49 per cent of Indigenous females were in the labour force. This was well below the 58 per cent of other Australian females who participated in the labour force in 2006 and 20 per cent below the participation rate of Indigenous males. Table 1 presents the Census results for 1981–2006 on participation rates by location of residence; major urban centres, other urban centres and non-urban (rural and remote) areas. The data show that Indigenous females were less likely to participate in the labour force in each of these locations than other Australian females. The gap was particularly pronounced in non-urban areas. While the share of the Indigenous female population participating in the labour force increased during the 1980s, this growth slowed during the 1990s.

LFP: labour force participation

This paper focuses on two factors that have been found in earlier studies to be significant determinants of Indigenous female labour supply (Hunter & Gray 2001). Borland and Hunter's (2000) analysis of the 1994 National Aboriginal and Torres Strait Islander Survey (NATSIS) shows that interactions with the criminal justice system are an important factor underlying Indigenous disadvantage in employment. For example, differences in arrest rates between Indigenous and non-Indigenous Australians may explain over 20 per cent of the difference in employment/population rates between those groups. The significance of arrest in explaining employment raises the possibility that interruptions to labour market experience and human capital formation are adversely affecting the labour supply of Indigenous females.

NATSIS: National Aboriginal and Torres Strait Islander Survey

Another potentially important interruption to labour market participation of females is child birth and child rearing. The high rate of fertility among Indigenous females is one of the most important dynamics perpetuating Indigenous disadvantage at a macro level (Hunter & Taylor 2004). This paper seeks to adapt the Borland and Hunter model to explore the microeconomic roles of both arrest and fertility on the LFP of Indigenous females.

The next section documents the theoretical underpinnings of female labour supply in the context of the literature on Indigenous Australia. This is followed by a brief description of the model used, an introduction to the 2002 National Aboriginal and Torres Strait Islander Social Survey (NATSISS) data, and an overview of the results. The concluding section begins to explore some of the policy implications of these findings.

NATSISS: National Aboriginal and Torres Strait Islander Social Survey

THE DETERMINANTS OF INDIGENOUS FEMALE LABOUR SUPPLY

The economic theory of the determinants of labour supply is well-developed (see Killingsworth 1983; Killingsworth & Heckman 2003; Pencavel 2003). The decision to supply labour to the market will depend upon a range of factors including the level of unemployment benefits, macroeconomic conditions, the level of labour demand in the local labour market as well as the social and economic conditions facing an individual and their family. For example, for mothers, the age of their children is likely to be very important as the balance between paid work and child-bearing and child rearing responsibilities change (Hersch & Stratton 1994).

Table 1. Labour force participation for Indigenous and non-Indigenous Australian females, 1981–2001

	1981 %	1986 %	1991 %	1996 %	2001 %	2006 %
Indigenous						
Major Urban	37.3	44.7	48.3	48.6	49.1	53.2
Other Urban	31.9	38.6	40.8	42.0	43.1	47.1
Non-urban	28.6	36.2	36.7	40.3	39.9	45.0
Non-Indigenous						
Major Urban	47.6	51.0	55.6	56.4	56.8	59.3
Other Urban	41.6	45.3	50.1	51.2	51.8	54.5
Non-urban	50.9	52.2	55.9	56.9	57.6	60.4

Source: Hunter (2004: 30) and unpublished cross-tabulations from 2006 Census.

In models of family labour supply, individuals make choices on LFP with the aim of maximising the welfare of the whole family unit. Therefore an individual's decision to search for work will depend on the opportunity cost of their non-market work (for example, child care and housework), their expected wage, their human capital endowments (health, schooling and labour market experience), the income of other members of the household and their preferences for paid employment. The interaction of demand and supply in the relevant labour market will decide whether or not the individual is employed. In labour markets where there are few opportunities available, individuals may be discouraged from seeking work and cease to participate in the labour market.

In addition to the standard variables included in the analysis of LFP, there are some particular factors which are likely to be important in the context of Indigenous Australians. Access to a traditional lifestyle, including hunting and gathering and use of an Indigenous language, is likely to influence an individual's decision about whether or not to participate in the mainstream labour market. A history of social exclusion from mainstream institutions in Australia is also likely to influence the decision to participate in paid work. Hunter and Gray (2001) found that Indigenous-specific cultural factors had a significant negative impact on participation in the mainstream labour market.

CDEP: Community Development Employment Projects

A further factor influencing LFP of Indigenous Australians has been the welfare-based work scheme, the Community Development Employment Projects (CDEP) scheme. Under this scheme, Indigenous communities historically had the option of pooling their welfare entitlements and receiving some supplementary government funding to undertake projects of a developmental nature in these communities, mainly located in rural and remote areas.[2] Participants were paid their welfare entitlements in exchange for working on a part-time basis. The scheme began in 1977 and since then there has been an extended debate about whether CDEP participation constitutes employment or not. It is a significant issue in discussions of Indigenous employment as over one-quarter of employed of Indigenous Australians or about 13 per cent of the working age population, were employed under the scheme at the time of the NATSISS (Gray & Chapman 2006). CDEP participation was counted as employment in the NATSISS data used in this study and the determinants of this type of employment are likely to be quite different from the determinants of mainstream employment.

There are a standard group of variables typically included in empirical estimates of labour supply. These include human capital as measured by years of schooling or educational qualifications and on-the-job training as measured by years of labour market experience. The accurate measure of this labour market experience is particularly difficult for groups such as Indigenous Australians who experience intermittent attachment to the labour market (see Gray & Chapman 2006). Family characteristics such as marital status and number of children, health, other household income and location of residence, all of which capture the effects of demand conditions in the relevant labour market, are also included. Rather than present a detailed justification for the inclusion of all the standard variables used here, the discussion will focus on the two factors of particular interest in this paper: the effect on LFP of the number of children ever borne to a female and the interaction with the justice system.

Earlier estimates of LFP and employment for Indigenous Australian females show that the presence of children had a negative effect (Borland & Hunter 2000; Daly 1995). In the current study we have used the number of children ever borne as our measure of fertility. The coefficient on this variable will capture the effect of ever having had children on the current decision to participate. The results show whether time spent out of the workforce in child-rearing has a long-term impact on LFP.

The Royal Commission into Aboriginal Deaths in Custody (RCADC) highlighted the alarming difference between Indigenous and other Australians in arrest and incarceration rates (Commonwealth of Australia 1991). Subsequent research has shown the implications of these differences for the employment status of Indigenous people (Borland & Hunter 2000). Borland and Hunter (2000) estimate on the basis of 1994 Australian Bureau of Statistics (ABS) data from the NATSIS, that having been arrested reduced the probability of employment for Indigenous males by between 10 and 20 per cent and Indigenous females by between 7 and 17 per cent. Hunter's (2001) analysis of the 1994 NATSIS data emphasised the role of gender, age, labour force status, alcohol consumption, whether a person had been physically attacked or verbally threatened and education in determining the likelihood of arrest. The complex social and economic reasons for high levels of Indigenous arrest are discussed in more detail in Hunter (2001) and Dodson and Hunter (2006). Arrest is likely to affect LFP and employment for a number of reasons.

RCADC: Royal Commission into Aboriginal Deaths in Custody

Firstly, on the demand side of the labour market, it may be used by employers as a screening device. Employers may shy away from potential employees with a history of interaction with the justice system. In addition there are some types of work where individuals with a criminal record are explicitly excluded, for example work with children. However this screening effect will not be important for participation in the CDEP scheme. Further, business may avoid geographic areas with high levels of criminal activity, thereby reducing the number of job opportunities (e.g., Dale 1976; Finn & Fontaine 1985; Schwartz & Skolnick 1962). On the supply-side, a history of arrest may reduce an individual's motivation to work and acquire labour market skills (Borland & Hunter 2000; Hunter & Gray 2001). Another possibility is that a person's employment outcome will 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 (Freeman 1988). Evidence from the 1994 NATSIS shows a strong positive relationship between alcohol consumption and arrest, so a history of arrest may indicate other individual characteristics that may have a negative effect on labour supply (Borland & Hunter 2000).

Arrest is also correlated with unemployment although the relationship tends to be in the opposite direction to that for employment (Hunter & Gray 2001; Office of Evaluation and Audit 1997). However, the effect of arrest on unemployment is much less than its effect on employment, especially for females (Hunter & Gray 2001). The main effect of arrest is to shuffle people from employment into unemployment. Arrest may also increase the number of discouraged workers by causing some people to leave the workforce entirely. The net effect of the arrest on LFP is probably driven by the lack of motivation of individual jobseekers to look for work after arrest has reduced their prospects of securing employment. Note that the individual's

appraisals of their employment prospects are not always entirely realistic, and the psychological dynamics of negative experiences and attitudes of arrested people may be a factor in the low levels of labour market participation.

In summary, the potential effects of criminal activity and arrests on LFP of Indigenous Australians are of interest for a number of reasons. First, the large disparity in arrest rates may explain part of the difference in employment/population rates between Indigenous and other Australians, which in turn perpetuates exclusion of Indigenous Australians from the labour market. Second, understanding the relation 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 the contact of Indigenous Australians with the criminal justice system arises due to differences in treatment of Indigenous and non-Indigenous Australians under that system rather than differences in behaviour.[3]

MODELLING LABOUR FORCE PARTICIPATION

The model used here is based on that developed by Borland and Hunter (2000). LFP is estimated as a function of exogenous explanatory variables (X_{it}) and an individual's history of arrest in the past five years (ARR_{it}).[4] The number of arrests and children ever borne were also estimated as a function of exogenous explanatory variables (Z_{it}) and (B_{it})

$$LFP_{it} = f(\alpha X_{it} + \gamma ARR_{it} + \delta EB_{it} + u_{it}) \quad (1)$$

$$ARR_{it} = g(\beta Z_{it} + v_{it}) \quad (2)$$

$$EB_{it} = h(\eta B_{it} + w_{it}) \quad (3)$$

Where LFP took a value of one for individual **i** in period **t** in the labour force (employed and unemployed) and zero for those not in the labour force; ARR is whether arrested in the last five years, EB whether ever borne a child, u_{it}, v_{it}, w_{it} are normally distributed error terms.

The purpose of estimating these equations was to address the potential issue of simultaneity bias in the estimated coefficients for both the effect of arrest and fertility. This bias might arise from the presence of some unobserved underlying factor that is important in determining labour force status, fertility and arrest history so the error terms are correlated or by direct causation in both directions between arrests and LFP on the one hand and fertility and LFP on the other. In order to address this issue, a sequential two stage process of estimation is used. The first stage is to estimate a probit equation for whether an individual had been arrested in the preceding five years. In order to identify the equation, variables were included in the Z_{it} that were not included in the participation equation. Generalised residuals were then calculated from this equation and used with the arrest history variable in the participation equation.[5] If the null hypothesis of a zero coefficient on the generalised residuals is accepted, the participation equation can be re-estimated as a single equation model excluding the generalised residual term.

The next issue considered was the relationship between fertility and labour market status. The same methodology was applied to the fertility variable as to the arrest variable. The first stage regression involves a probit model of whether a female ever bore a child. The generalised residual for this regression are calculated and used in a probit model of LPF and the t-statistics can be interpreted as a test of endogeneity of fertility on LFP. These results are reported below.

THE DATA

Aggregate data for Indigenous Australians are limited. The five-yearly Census of Population is the most comprehensive source of information. Since 1971, respondents have been given the option to identify themselves as Aboriginal or Torres Strait Islanders (or since 1996 as both) and individuals over the age of 15 years are asked a series of questions on income, labour force status, educational qualifications and demographic characteristics. An important issue in interpreting changes over time in the Census data has therefore been the increasing propensity for individuals to self-identify as Indigenous Australians. In addition to the Census, there have also been two surveys conducted by the ABS in 1994 and 2002 that have specifically focused on the Indigenous population and included questions on a wider range of topics than those covered by the Census (ABS 1995; 2004). The estimates reported in this paper are taken from data collected as part of the second of these surveys, the NATSISS in 2002.[6]

The 2002 NATSISS is the second major nationwide survey specifically targeted to collect a large range of information on Indigenous Australians. Carried out between August 2002 and April 2003 it collected information from 9,359 individuals aged 15 years and over from 5,887 households (n.b., the sample excluded people in non-private dwellings such as prisons, hospitals, hostels etc.). While some of the information had never been collected before for the Indigenous population, a number of the questions were broadly comparable to the 1994 NATSIS (Biddle & Hunter 2006b).

The survey was conducted by personal interview and included a wide range of questions on demographic, cultural and language, education, employment, income, financial stress, health, housing, transport, information technology and crime and justice topics. The study reported here is based on 4,461 females and 3,294 males for whom there was complete information on all the data required to measure the factors underlying LFP.

One limitation of the NATSISS data is the restriction of the survey to Indigenous Australians so it is not always possible to make comparisons with outcomes for other Australians.[7] The 2002 NATSISS was conducted more or less concurrently with the 2002 General Social Survey (GSS) which collected information about the total adult Australian population (the Indigenous and non-Indigenous populations are not separately identifiable in the GSS). While many of the data items in the 2002 NATSISS are comparable with the GSS, the GSS did not collect information in very remote areas and was limited to individuals 18 years and over. Given the limited ability to directly compare any analysis of NATSISS and the GSS, combined with the fact that the former provides a richer source of data on the interaction with the criminal justice system, this paper focuses solely on analysing NATSISS data.

GSS: General Social Survey

The variables used in the analysis are described in Appendix A. Table A1 presents summary descriptive statistics for the variables used in this study. Eighty-two per cent of the females had given birth to at least one child with almost one-third of those surveyed having given birth to four or more children. Eleven per cent of the females had been arrested, below half the arrest rate for males. The category of residence with the largest share of females, 44 per cent, was rural and remote residence.

THE RESULTS

The regression results for the joint modeling of arrest and LFP are presented in Appendix Table B1. The results show that the arrest history increased among those females who drank alcohol in the last 12 months, particularly those who were high risk drinkers, and those who had been taken from their natural family. Females with education levels beyond Year 9, living in a remote area and in a household including non-Indigenous people had a lower probability of arrest. The results of the participation model, including an arrest dummy and the associated generalised residual, show that the null hypothesis of a coefficient of

Table 2. Distribution of number of children ever borne, Indigenous females aged 15 and over, 2002

Number of children ever borne	Frequency	Per cent
0	1,226	23.0
1	645	12.1
2	925	17.3
3	881	16.5
4	651	12.2
5	406	7.6
6	273	5.1
7	336	6.3
Total	5,343	100.0

Note: Mean and standard deviation of the number of children ever borne are 2.6 and 2.1 respectively.

zero on this residual can be accepted. Accordingly, the preferred specification uses the arrest variable only. Note that the finding that arrest is exogenous with respect to female labour supply is not sensitive to the inclusion of a measure of fertility in the participation equation.

The results for the test of endogeneity for fertility are presented in Appendix Table B2 and show that fertility cannot be taken as an exogenous variable with respect to LFP. Fertility is identified by the variable 'age at which a person was first charged'. The younger females were first charged with an offence, the more likely they were to have ever borne a child. This correlation could be explained by the argument that the females charged at a young age are likely to have fewer employment options and face a lower opportunity cost from child bearing. The results show that when the endogeneity of fertility is controlled for, there is no longer a significant effect of having had children on LFP. That is, once one controls for the interaction with the criminal justice system, the effect of fertility on labour supply is not evident—at least when fertility is measured as ever having had children.

Another technical issue when using certain count data models is that the over-dispersion in the distribution of children ever borne may affect the results (the variance in the sample is greater than the mean—see Table 2). There are a relatively large number of Indigenous females who have never borne a child indicating that a zero-inflated negative binomial model may be more appropriate for estimating the first equation. This model is often used to improve the under-prediction of zeros that occurs in a Poisson model when there is over-dispersion.

Appendix Table B3 further extends the estimation to take account of the over-dispersion of the variable 'number of children ever borne'. A 'hurdle model' of count data attempts to address this issue by using two equations: a binary model to predict the 'zeros' and a zero-truncated model for the remaining counts. Lambert (1992) introduced the zero inflated count models which allows the zeros to be generated by two processes, the binary model and the (non-truncated) count models. In this way, the count data model (in this case the negative binomial) is augmented with a binary model which inflates the 'zeros' (here never having borne children). The zero inflated component of this model has only one significant variable, the difficulty in speaking English. The count data component of the model is adjusted to take into account this binary model to provide an estimated number of children ever borne.

Table 3. Estimated effects on labour force participation, Indigenous females aged between 15 and 64 who were not studying full-time

	Coefficient	Standard errors	Marginal effects	Standard errors
arrested	-0.290	(0.067)	-0.115	(0.026)
numebhat	0.704	(0.091)	0.281	(0.036)
solepar	-0.240	(0.045)	-0.095	(0.018)
drinks	0.310	(0.045)	0.123	(0.018)
highrisk	-0.233	(0.090)	-0.092	(0.035)
logotinc	0.196	(0.033)	0.078	(0.013)
age	-0.136	(0.025)	-0.054	(0.010)
age^2	0.001	(0.000)	0.000	(0.000)
innerreg	-0.186	(0.078)	-0.074	(0.031)
outerreg	-0.276	(0.071)	-0.110	(0.028)
remote	0.106	(0.068)	0.042	(0.027)
difineng	-0.123	(0.057)	-0.049	(0.023)
degrdip	1.844	(0.120)	0.506	(0.015)
certif	1.013	(0.087)	0.357	(0.024)
year12	1.023	(0.094)	0.362	(0.026)
year1011	0.480	(0.061)	0.189	(0.023)
year9	0.209	(0.072)	0.083	(0.028)
mixedh	0.666	(0.071)	0.257	(0.026)
fairpoor	0.214	(0.047)	0.085	(0.018)
Constant	-0.375	(0.400)		
Pseudo R^2	0.131			
Number of observations	4,461			

Note: Description of variables available in Appendix Table A1. The result for estimated effect of number of kids ever born on labour force participation is not sensitive to the estimation technique used in the first stage regression (i.e., negative binomial or poisson models). Marginal effect for binary variables measure the effect of changing the value of the independent variable from 0 to 1, whereas the marginal effect of continuous variables (e.g., age & logotinc) is the effect of a unit change around the mean value.

Table 3 presents the results taking into account the problems of endogeneity of fertility and over-dispersion of the variable. Column 4 presents the results for the marginal effects of changes in the independent variables on Indigenous female LFP. The largest effects were the increase in participation associated with additional educational qualifications. A university degree increased the probability of participating in the labour force by 51 percentage points compared with a female who had not completed Year 9, holding all other characteristics constant.[8] Location of residence was also a significant determinant of female labour supply. The increase in participation for those living in a remote or very remote area reflects the importance of the CDEP scheme in these areas. The results show that having 'some' alcohol consumption was associated with a higher probability of participation but that high risk alcohol consumption reduced participation. This is in line with earlier studies (MacDonald & Shields 2004; Terza 2002).

Turning to the results for the focus variables of this study, they show that increasing the number of children borne from two to three will have a significant positive effect on the probability of participating in the labour force. This suggests that the additional demands put on family finances by children may encourage females to participate in the labour force.

Another possible explanation is that the inclusion of CDEP participants among the employed means that sole parent participants in this scheme have been counted among the employed. The selection into CDEP participation does not reflect the usual determining factors of LFP. This second explanation is unlikely to explain the difference between the insignificant labour supply effect of having borne any child and the positive effect of increasing the number of children after having at least two children.

The effect of an arrest history in the last five years was also to reduce LFP by 11.5 percentage points. Unfortunately it has not been possible to compare the size of this effect for Indigenous females with results for other Australian females.

SUMMARY AND CONCLUSION

The fact that Indigenous Australian females are less likely to participate in the labour market than other Australian females has been a focus of policy concern. This paper highlights some of the significant factors influencing the poor labour market outcomes for Indigenous females and confirms the findings of earlier research. Variables such as education, difficulty in communicating in English, location of residence and other household income (including welfare payments) remain important determinants of Indigenous female labour supply. Both the focus variables, fertility and interaction with the justice system, show a significant effect on Indigenous female participation. A history of arrest reduces the probability of participating in the labour force. Once the endogeneity and over-dispersion of fertility are taken into account, the results show that ever having borne a child does not have a significant impact on LFP—and may actually have a positive impact on labour supply as one's family size increases. The results presented here do not control for the current age of the children but they do suggest that having had children at any stage of adult life does not lead to a long term reduction in labour supply once the level of interaction with the criminal justice system is taken into account.

High fertility rates among Indigenous females reflect a complex interaction between social and economic factors. One significant underlying determinant may be the high rates of infant mortality in the Australian Indigenous population (Kinfu 2006). Parents may choose to have a larger number of children if they expect that some of them will die before adulthood. The institutional framework of the Australian welfare system may also influence fertility and LFP.[9] Benefits are related to the number of dependents and the combination of high fertility rates and low levels of labour market skills create high replacement ratios of welfare income compared with potential employment income which may have discouraged participation in the labour force for those with children under the age of 16 years (Daly & Hunter 1999). Access to childcare remains an important issue for Indigenous females although it does not appear to be the major cause of their low levels of LFP.

The empirical estimates presented here show a significant negative effect of an arrest history on Indigenous female LFP. Earlier studies show a positive correlation between high risk drinking and arrest so if these two negative effects are combined, there is likely to be a substantial reduction in LFP. The results suggest a need for strategies to reduce arrests among Indigenous females. These might include developing alternative ways to deal with potential problems before they reach the stage of interaction with the justice system.

The results also show the importance of location of residence in determining Indigenous female labour supply. Biddle and Hunter (2006a) found that Indigenous Australians were less likely to move in response to employment opportunities than other Australians and to be more influenced by social and cultural factors. For these reasons, conditions in the local labour market are particularly important and the development of employment opportunities in the areas in which Indigenous people live may have a particular role to play in generating employment. Education and training are important in promoting attachment to the labour force. Skill formation however, needs to be promoted in the context of the local labour markets in which Indigenous people are searching for work.

There is a substantial literature on the interaction between economic outcomes and fertility decisions (Becker, Murphy & Tamura 1990). Overall, higher levels of education and employment are often associated with lower fertility, an observation that is consistent with Becker's model of time allocation—especially through the higher opportunity cost of an educated person's time (Becker 1965). Our findings controlled for the role of education in fertility decisions and its effect on labour supply. While the empirical findings indicate that the interaction with the criminal justice system can be taken as given with respect to contemporary LFP, it provides an important predictor of Indigenous fertility. Therefore, crime directly reduces labour supply and employment. In addition, being charged with an offence as a minor is likely to increase the prospect of having children, and indeed the number of children that a women eventually have.[10] It is tempting to claim that the effect of such crime on fertility is causal (e.g., as it is historically fixed with respect to the decision to have children). However, it is important to acknowledge that (very) early involvement with the criminal justice system may reflect unobservable factors such as disruptive family and community life that may hinder the social and physical development of Indigenous children.

The primary policy implication of this paper is that it emphasises the importance of providing support to Indigenous families with children. Providing such support unambiguously improves Indigenous welfare as it expands the developmental options available to children and will expand the capacity to realise the preferences of many mothers who want to participate in the labour market. Such support could take many forms, including as discussed above more education and training and the development of employment opportunitites where Indigenous people live. Access to and availability of affordable child care are likely to be key issues. Community support is also likely to be important vital for facilitating development of Indigenous children.

The CDEP scheme historically has been the major policy instrument for providing support to communities and there is some concrete evidence that the scheme has reduced the social dysfunctions that undermine a constructive environment for child development (Office of Evaluation and Audit 1997). In contrast, Noel Pearson emphasises the role of the 'real economy' in rebuilding social norms in communities and is particularly critical of passive welfare—including CDEP scheme employment—as perpetrating dependence and negative social norms (Cape York Institute 2007). Taken to its logical extreme Pearson's argument might preclude many of the existing forms of community support. While it would be a mistake to discount the long-term corrosive effect of excessive reliance on unconditional welfare, the extant evidence seems to support the position that the CDEP scheme has a small positive effect on important individual and community outcomes (see Altman, Gray & Levitus 2005). In the short-term support for this scheme may be the best option for Indigenous females who are interested in developing skills for employment.

The National Crime Prevention Report (Developmental Crime Prevention Consortium 1999) described how the developmental processes facing children and youth are crucial determinants of economic engagement and the experience of individuals with the criminal justice system. The Report provides a comprehensive overview of the likely processes from various disciplinary perspectives. While the focus is on individual 'pathways', community and household factors are acknowledged to feed into youth getting involved in a cycle of involvement in the criminal justice system.[11]

The low level of LFP by Indigenous females is a complex issue requiring policy initiatives on a number of fronts (community, household or individual level interventions). Unfortunately, the chronic under-resourcing of Indigenous policy is an ongoing issue that requires substantial investment in infrastructure in Indigenous communities. Notwithstanding well documented and entrenched Indigenous disadvantage, it is possible that Commonwealth government spending on Indigenous-specific issues (expressed in per capita terms) has actually fallen in the last seven years (Hunter 2007). Whatever the merits of the current spending levels, it is worth asking whether funding has been spent in the most effective areas.

NOTES

1. For a survey of the major indicators and a comparison with results for non-Indigenous Australians see Altman, Biddle & Hunter (2004) and Altman & Hunter (2003).

2. In the Australian context, welfare includes income support for the unemployed and sole parents.

3. Broadhurst (1997: 417) argues that there is "...clear statistical support for the proposition that "race" or Aboriginality increases the risk of arrest". However, he also cautions that "...Aboriginality may be a factor or variable that catches a number of stigmatizing characteristics (such as truancy, unemployment, substance abuse) and in this sense operates as a shorthand "predictive" model for police...".

4. Concerns have been expressed that individual's are likely to under-report their number of arrests. Borland and Hunter (2000) were able to compare estimates of the proportion of Indigenous people in Western Australia who had been arrested in the past four years according to the 1994 NATSIS and West Australian police records. They found that the proportions were very similar, 25.4 per cent according to the NATSIS and 24.6 per cent according to official records. This finding increases confidence in the survey results on arrest history.

5. Borland and Hunter (2000) estimated the generalised residual for arrest, which in turn was used to estimate a system of two probit equations (for arrest and employment), as:

$$\hat{\varepsilon}_{it} = \{[\mathrm{ARR}_{it} - \Phi(Z_{it}\hat{\beta})]\phi(Z_{it}\hat{\beta})\}\{(1-\Phi(Z_{it}\hat{\beta}))\Phi(Z_{it}\hat{\beta})\}^{-1} \quad (4)$$

where Φ and ϕ are the cumulative distribution function and probability density function of the standard normal distribution, is the set of explanatory variables included in equation (2), and is the probit estimate of coefficients on the explanatory variables in equation (2). While Borland and Hunter were interested in the relationship between arrest and employment, this paper explores how arrest and fertility interact with LFP using the generalised residuals estimated from equations (2) and (3). In order to separately identify the arrest and fertility equations from the LPR equation, it is necessary that the arrest and fertility equations include some explanatory variable(s) not included in the LPR equation.

6. For a fuller discussion of the results of this survey see Hunter (2006).

7. See for example the discussion by Dodson and Hunter of the difficulties in comparing crime-related statistics between the NATSISS and the General Social Survey (GSS).

8. The base category is metropolitan female residents who have no difficulty in communicating in English with service providers, did not stay at school till Year 9, female had not ever borne a child and lived only with Indigenous people, self-assessed health status was good or excellent, and had not drunk alcohol in the last 12 months.

9. Cultural factors are also likely to be important—for example, historically there has been a social norm in Indigenous communities of having large families. Becker, Murphy & Tamura (1990) describe economic processes that result in two social equilibriums—of high fertility and low growth versus low fertility and high growth—that do not relying on cultural norms. Increasing educational participation of Indigenous women may lead to a new equilibrium among Indigenous Australian characterised by low fertility and high engagement with the labour force. There is some evidence of recent fall in Indigenous fertility which may foreshadow a change in the dominant 'social norm'.

10. Obviously, the effect of crime after the 15th birthday on fertility was not used in the statistical specification as it might compromise the capacity to jointly model arrest, fertility and labour supply. As it turns out, arrest and interaction with the criminal justice system is not endogenous with respect to labour supply, and hence future analysis should focus on the joint modelling of fertility and labour supply and the role of crime in driving both outcomes.

11. While there is no consensus on how to address community dysfunction in the mainstream literature, and indeed no agreement on the extent to which public funds should be used, interested readers are referred to a recent special issue of the *Australian and New Zealand Journal of Criminology* for an update on the literature reviewed in the original *National Crime Prevention Report* (France & Homel 2006).

APPENDIX A

Table A1. Description of variables and summary statistics for regression analysis

Variable name	Description	Mean	Std. Dev.
Dependent variables			
arrested	Whether arrested in last 5 years	0.107	0.309
eb	Whether child ever born	0.815	0.388
lfpart	Whether participating in labour force	0.528	0.499
numkidseb	Number of children ever born	2.57	2.10
Independent variables			
age	Age	35.473	12.063
agecharged1	First charged with an offence between 8 and 14 years old	0.026	0.160
agecharged2	First charged with an offence between 15 and 17 years old	0.063	0.243
certif	Highest level of educational attainment is a degree or diploma	0.093	0.290
degrdip	Highest level of educational attainment is a degree or diploma	0.073	0.260
difineng	Difficulty in speaking English	0.163	0.369
drinks	Ever drank alcohol	0.636	0.481
fairpoor	Self-assessed health status is fair or poor	0.250	0.433
highrisk	Drinks alcohol at high risk level	0.052	0.223
indiglan	Speaks an Indigenous language	0.434	0.496
innerreg	Inner-regional areas	0.131	0.338
logotinc	Log of Income of other household residents	6.052	0.654
mixedh	Both Indigenous and non-Indigenous people living in household	0.254	0.436
multifam	More than one family living in a household	0.187	0.390
numebhat	Predicted number of children ever born	2.632	1.102
outerreg	Outer-regional areas	0.273	0.446
remote	Remote areas	0.441	0.497
solepar	Sole parent	0.346	0.476
taken	Individual taken from natural family as child	0.083	0.276
year1011	Highest level of educational attainment is a Year 10 or 11	0.376	0.485
year12	Highest level of educational attainment is a Year 12	0.110	0.313
year9	Highest level of educational attainment is a Year 9	0.135	0.341
No. of observations	4,461		

Note: In this and the following Appendix tables, the analysis refers to Indigenous females aged between 15 and 64 who were not studying full-time.

Table B1. Test of endogeneity of arrest on labour force participation

	Dependent variables			
	Arrested	Participation	Participation	Participation
eb		-0.668	-0.670	
		(0.062)	(0.062)	
arrested		-0.266	0.116	-0.071
		(0.067)	(0.398)	(0.392)
generalised residual from arrest equation			-0.209	-0.112
			(0.213)	(0.209)
age	0.036	0.083	0.083	0.042
	(0.017)	(0.011)	(0.011)	(0.010)
innerreg	-0.048	-0.025	-0.017	-0.039
	(0.098)	(0.076)	(0.076)	(0.075)
outerreg	-0.100	-0.024	-0.014	-0.047
	(0.083)	(0.065)	(0.065)	(0.065)
remote	-0.258	0.329	0.351	0.310
	(0.087)	(0.064)	(0.067)	(0.066)
difineng	0.141	-0.245	-0.258	-0.225
	(0.071)	(0.056)	(0.058)	(0.057)
degrdip	-0.673	1.289	1.320	1.323
	(0.159)	(0.100)	(0.104)	(0.101)
certif	-0.254	0.762	0.767	0.767
	(0.114)	(0.082)	(0.081)	(0.081)
year12	-0.538	0.647	0.681	0.683
	(0.122)	(0.081)	(0.088)	(0.087)
year1011	-0.195	0.433	0.445	0.418
	(0.079)	(0.061)	(0.062)	(0.061)
year9	0.040	0.257	0.253	0.225
	(0.091)	(0.073)	(0.073)	(0.072)
solepar	0.158	-0.183	-0.193	-0.253
	(0.059)	(0.046)	(0.047)	(0.047)
mixedh	-0.267	0.296	0.314	0.306
	(0.076)	(0.052)	(0.055)	(0.055)
fairpoor	-0.212	0.199	0.213	0.200
	(0.065)	(0.047)	(0.049)	(0.048)
drinks	0.415	0.310	0.289	0.312
	(0.067)	(0.045)	(0.050)	(0.049)
highrisk	0.508	-0.256	-0.314	-0.250
	(0.096)	(0.091)	(0.109)	(0.106)
logotinc		0.192	0.191	0.206
		(0.033)	(0.033)	(0.033)
taken	0.361			
	(0.090)			
CONSTANT	-1.495	-2.799	-2.867	-2.613
	(0.288)	(0.282)	(0.289)	(0.287)
Pseudo R^2	0.1152	0.1424	0.1426	0.1213
Number of observations	4,461	4,461	4,461	4,461

Table B2. Endogenity of effect of fertility on labour force participation

Any children ever born	Labour force participation	
Predicted probability of fertility		-0.305
		(0.244)
arrested		-0.254
		(0.069)
age	0.206	0.105
	(0.012)	(0.051)
age^2	-0.002	-0.001
	(0.000)	(0.001)
innerreg	0.145	0.008
	(0.086)	(0.085)
outerreg	0.156	-0.002
	(0.074)	(0.075)
remote	0.101	0.324
	(0.072)	(0.066)
difineng	-0.135	-0.262
	(0.067)	(0.066)
degrdip	-0.327	1.200
	(0.103)	(0.129)
certif	-0.088	0.728
	(0.097)	(0.084)
year12	-0.215	0.595
	(0.090)	(0.097)
year1011	0.089	0.438
	(0.076)	(0.063)
year9	0.235	0.300
	(0.095)	(0.092)
mixedh	-0.240	0.226
	(0.056)	(0.077)
fairpoor	-0.031	0.182
	(0.054)	(0.047)
highrisk	-0.260	-0.295
	(0.107)	(0.108)
drinks		0.331
		(0.045)
solepar		-0.245
		(0.045)
logotinc		0.205
		(0.033)
CONSTANT	-3.181	-3.536
	(0.216)	(0.818)
Pseudo R^2	0.178	0.122
Number of observations	4,461	4,461

Note: The instruments for fertility in these probit models are the age at which a respondent was age first charged (jointly significant at the 10% level). The endogeneity test for fertility is the t-statistic on generalised residual from the probit regression of whether a female had ever born a child which is significant at the conventional levels (i.e. with a t-statistic of 8.5).

Table B3: Zero-inflated negative binomial model of number of children ever born

Model of number of children ever born	Coefficient	Standard error
age	0.138	(0.006)
age^2	-0.001	(0.000)
innerreg	0.090	(0.037)
outerreg	0.136	(0.032)
remote	0.122	(0.031)
degrdip	-0.246	(0.042)
certif	-0.103	(0.037)
year12	-0.197	(0.041)
year1011	-0.004	(0.027)
year9	0.023	(0.032)
mixedh	-0.210	(0.024)
agecharged1	0.171	(0.058)
CONSTANT	-2.071	(0.113)
Zero-inflated component (never bore any children)		
difineng	0.641	(0.191)
CONSTANT	-2.842	(0.113)
Vuong test of zero-inflated negative binomial and standard negative binomial N(0,1)	17.37	
Likelihood-ratio test of no over-dispersion – $\chi^2(1)$	25.99	
Number of observations	4,489	

Note: The pattern of coefficients is similar for the standard negative binomial model except that difineng is not significant at the conventional levels. For Vuong test, see Vuong (1989).

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