Does it pay to go to school? The benefits of and participation in education of Indigenous Australians

Nicholas Grahame Biddle

April, 2007

A thesis submitted for the degree of Doctor of Philosophy of
The Australian National University

Contribution

The empirical results and analysis presented in this thesis are an original contribution by the PhD candidate. Where joint research was undertaken during the candidature and used in this thesis, it has been acknowledged as such in the body of the text. The applicable research is listed below, alongside the contribution from the PhD candidate:

- Altman, Biddle and Hunter (2005) – Generated empirical results and contributed to writing of the paper.
- Altman, Buchanan and Biddle (2006) – Generated empirical results and contributed to writing of the paper.
- Biddle and Hunter (2006a) – Roughly equal contribution between the authors in generating the results and writing the paper.
- Biddle and Hunter (2006b) – Roughly equal contribution between the authors in generating the results and writing the paper.
- Biddle and Hunter (2006c) – Roughly equal contribution between the authors in generating the results and writing the paper.
- Biddle, Hunter and Schwab (2004) – Generated most of the empirical results and contributed to writing of the paper.
- Biddle and Webster (2007) – Generated the empirical results and wrote the majority of the paper.
- Taylor and Biddle (2005) – Generated the empirical results.

Signed   Date

Nicholas Grahame Biddle

Acknowledgements

I would like to thank my supervisor, Dr. Boyd Hunter for the academic, professional and personal guidance that he has provided throughout my candidature. I would also like to thank Dr. Jerry Schwab and Dr. Robert Breunig for their comments, suggestions and general feedback that they have given on my thesis. I have benefited substantially from their subject matter and technical expertise.

This thesis represents the major output from an Australian Research Council Linkage Grant between the Centre for Aboriginal Economic Policy Research at the Australian National University and the Australian Bureau of Statistics (ABS). I would therefore like to thank all those staff and students in both organisations who have been involved directly or indirectly in the project. In particular, Prof. Jon Altman, Mr. Jon Hall and Mr. Ken Tallis who were all involved at the initiation stage.

I would also like to thank those Indigenous Australians who took the time to participate in the studies that the empirical analysis in this thesis is based on. Without the good will of the community, such ABS collections would not be able to continue to support evidence based policy development.

This thesis was proof-read by Dave Gardner of Red Lettuce Communications under the guidelines set down by the Institute of Professional Editors. The edit was restricted to Standard D (language and illustrations) and Standard E (completeness and consistency) under the Australian Standards for Editing Practice.[1]

Finally, I would like to thank my family and friends for their support throughout my candidature. In particular I'd like to thank my partner Ms. Aarthi Ayyar for her encouragement both emotionally and intellectually. Without her, none of this would have been possible.

[1] http://www.iped-editors.org/

Abstract

Those who have finished high school and/or obtained non-school qualifications experience a range of positive outcomes throughout their lives. Despite these benefits being likely to apply to the Indigenous Australian population, current as well as past participation in education is substantially lower than that of the non-Indigenous population. Some reasons for this relatively low participation may be locational and monetary disadvantage, household overcrowding and a curriculum that is not always relevant. How Indigenous Australians form their expectations about the benefits of education and what these expectations might be (accurate or otherwise) may also influence educational participation.

This thesis looks at the education outcomes of Indigenous Australians. There are two main research questions are examined. The first is what are the relative benefits of education for the Indigenous population? The main outcomes that are focussed on are employment and income; however, there is also analysis of the extent to which those with higher education levels report better health outcomes or more favourable health behaviour.

The second main research question is what factors are associated with the decision to attend high school? That is, does the Indigenous population respond to the economic incentives to undertake education as estimated in this thesis? In addition, other factors at the individual, household and area level are likely to influence the social costs and benefits of education, as well as geographic and financial access. The extent to which these are associated with high school participation is also examined.

Contents

Tables

Figures

Abbreviations and Acronyms

ABS	Australian Bureau of Statistics
AEP	National Aboriginal and Torres Strait Islander Policy
AIGC	Australian Indigenous Geographical Classification
ARIA	Accessibility/Remoteness Index of Australia
ASGC	Australian Standard Geographical Classification
ATSIC	Aboriginal and Torres Strait Islander Commission
CA	Community Areas
CAI	Computer Assisted Interviewing
CD	Collection District
CDEP	Community Development and Employment Projects
CIFs	Community Information Forms
CSOM	Chronic Suppurative Otitis Media
CURF	Confidentialised Unit Record File
CYI	Cape York Institute
ERP	Estimated Resident Population
GSS	General Social Survey
HCM	Human Capital Model
HEP	Higher Expectations Program
IRR	Internal Rate of Return
LSAC	Longitudinal Study of Australian Children
LSIC	Longitudinal Study of Indigenous Children
LSAY	Longitudinal Survey of Australian Youth
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs
MLE	Maximum Likelihood Estimation
NATSIS	National Aboriginal and Torres Strait Islander Survey
NATSIHS	National Aboriginal and Torres Strait Islander Health Survey
NATSISS	National Aboriginal and Torres Strait Islander Social Survey
NCA	Non-Community Area
NHS	National Health Survey
NHS(G)	National Health Survey (General)
NHS(I)	National Health Survey (Indigenous)
OLS	Ordinary Least Squares
PAPI	Pen and Paper Interviewing
RADL	Remote Access Data Laboratory
SIF	Special Indigenous Form
SLA	Statistical Local Area
SLCD	Statistical Longitudinal Census Dataset
SSD	Statistical Sub-Division
TAFE	Tertiary and Further Education
VET	Vocational Education and Training

Chapter 1 Introduction: The role of education in improving the outcomes of Indigenous Australians

It is not difficult to find figures that highlight the relative disadvantage of Indigenous Australians. For example, compared to the non-Indigenous population life expectancy is 17 years less, unemployment rates 3.2 times higher and Indigenous Australians are 11 times more likely to be imprisoned (PC 2005). As argued by Jackie Huggins, co-chair of Reconciliation Australia (Huggins 2005), the problem is that 'Australians have heard these numbers so many times before, they're numb to the human significance.'

Such relative disadvantage would be considered unacceptable for other population subgroups, yet for the Australian Indigenous population they have been recognised and present for many years. In a keynote address to the *2006 Economic and Social Outlook Conference*, the Treasury Secretary Dr Ken Henry argued that continuing levels of disadvantage 'has not been for want of policy action' yet 'decades of policy action have failed' (Henry 2006, p.14).

Notwithstanding this failure to fully address continuing disadvantage, there has been improvement in some areas of Indigenous outcomes (Altman, Biddle and Hunter 2005). However, the gains that have been made are not large enough to make substantial inroads into many aspects of relative disadvantage. These gains are especially slow when viewed alongside the potential opportunities presented by a rapidly growing economy and large government revenues. According to Professor Mick Dodson 'until our children grow up with the same chances as other Australian kids, the same life expectancy, the same opportunities, we all need to do more' (Dodson 2006, p.2).

That there has been at best slow improvement in Indigenous outcomes should not be taken as evidence that the problems are intractable. For example, the organisations entered into the Indigenous Governance Awards[2] show that there is potential for highly

[2] The Indigenous Governance Awards are a partnership project between Reconciliation Australia and BHP Billiton and are designed to encourage, reward and promote best practice in Indigenous governance. More

successful businesses to be owned and managed by Indigenous Australians. Also, the experiences of Canada, New Zealand and the USA in making more substantial gains in the outcomes of their Indigenous populations (Ring and Firman 1998; and Hunter 2005) is further evidence that the policy issues for Australian Aboriginal and Torres Strait Islanders should not be written off as insolvable. While it is not realistic to assume that the policy actions in one country will necessarily be easily transferable to another, it does show that with the right policy mix substantial improvement can be made.

One aspect of Indigenous socio-economic outcomes that was identified by Altman, Biddle and Hunter (2005) as having improved both relatively and absolutely in the last few decades is education participation and attainment. For example, in 1971 only 3.2% of adults who identified as being Indigenous in the Census of Population and Housing (the Census) had completed a post-school qualification. In the 2001 Census, the corresponding figure was 18.2%. This still lags well behind the non-Indigenous percentage (41.6%), yet continued improvements in education outcomes is the 'primary vehicle by which economically and socially marginalized adults and children can lift themselves out of poverty and obtain the means to participate fully in their communities' (UNESCO 2003).

1.1 Capabilities, education and the human capital model

Those who have finished high school and/or obtained non-school qualifications experience a range of positive outcomes throughout their lives compared to those who have not. Their incomes may be higher, unemployment less likely and their health better (Card 2001; Wolfe and Haveman 2001; Borland 2002). An individual's own education is also likely to benefit their community or household. Those with higher education levels may provide positive role models for those around them, ultimately increasing overall levels of education. Huggins (2006) identifies how education can have important additional effects for the Indigenous population. That is, it 'serves to promote

---

information, including profiles of winners and finalists, can be found at: http://iga.reconciliation.org.au/igawards/about.html reconciliation' because it provides the 'key, the tools, the self esteem, to triumph over disadvantage in other areas of people's lives – in employment for instance, and in health' (Huggins 2006, p.4).

The role of education is more than just imparting skills and knowledge to be used in the labour market. Education also empowers individuals and communities. It improves a person's capabilities or their ability to 'lead the kind of lives they value – and have reason to value' (Sen 1999, p.18). These additional effects of education are analogous to the developmental goals of agency as opposed to wellbeing, as outlined in Sen (1985). Here, the author makes the distinction between the role of a person as a patient whose wellbeing is monitored and treated and the role of a person as an agent who can choose to act (or not act) in one way or another in a manner that they think best improves their own wellbeing. While the philosophical considerations of agency in Sen (1985) are beyond the scope of this thesis, the economic implications in terms of service delivery and resource allocation as outlined in Sen (1999) are more pertinent. In essence, not only does education increase the range of potential benefits that a person can obtain throughout their life, it also allows them to make more informed decisions about how they trade off certain benefits with the associated costs.

The role of capabilities and the work of Amartya Sen more broadly have been referred to quite heavily by Noel Pearson, Director of the Cape York Institute. Pearson (2005) makes the point that government assistance that focuses more on wellbeing and less on building a person's capabilities has the potential to entrench disadvantage as opposed to alleviate it. In this respect, spending on health and education should be one of the main focuses of assistance for Indigenous Australians because 'people who are unhealthy and uneducated do not have true freedom because they lack the capabilities to make real choices about their lives' (Pearson 2007). Furthermore, employment creation as opposed to income support is in Pearson's opinion the more effective means to improving long-term outcomes.[3] To paraphrase Sen (1999, p.191) 'while there is every reason not to slacken

[3] This is one reason why the employment benefits of education are a major focus of this thesis.

the concern about [Indigenous Australians'] well-being … there is also an urgent and basic necessity … to take an agent-oriented approach.'

In motivating the benefits of education by referring to agency and capabilities, one must also recognise that as decision-makers, Indigenous youth have their own incentives, costs and benefits that they trade off. This has important implications for how one analyses under-investment in education. Unlike in earlier periods where many Indigenous Australians were systematically excluded from participating in formal education (Mellor 1990), all levels of government have identified improving education participation of Indigenous Australians as a priority. For example, some of the long-term National Aboriginal and Torres Strait Islander Policy (AEP) goals are access to pre-school services on a comparable basis, all Aboriginal and Torres Strait Islander children having local access to primary and secondary schooling and equitable access to post-compulsory education.

The above policy goals were first articulated as part of the AEP in 1990 and built on the work of previous taskforces (Biddle, Hunter and Schwab 2004). Under such conditions, Indigenous youth are in some ways opting out of education. This should not be construed as an attempt to 'blame the victim' and the continuing inter-generational effects of exclusion from formal education may still be playing a part (Schwab and Sutherland 2003). However, financial and locational barriers to accessing schools and other education, as well as the incentives and motivations for youths and the parents of Indigenous children to undertake education or send their children to school, may all be having a large effect on underinvestment in education.

To improve Indigenous education outcomes, it is therefore important to understand the barriers to undertake education as well as the relative incentives to complete high school and undertake post-school studies. One framework that explicitly takes into account the barriers and incentives to participate in formal education is the Human Capital Model (HCM). The HCM has formed the basis of a number of the theoretical and empirical models since the 1960s studying education participation. At its most basic, it states that individuals form an expectation about their possible income streams conditional on their educational choice and take out the costs of education (both the direct costs and income foregone). This leaves them with an estimate for the returns to education which is compared to all other investments and a decision made about investing in education based on its relative profitability.

The HCM provides a useful way to conceptualise the barriers to education participation that have been identified in the literature for Indigenous Australians. These include locational and monetary disadvantage, household overcrowding and a curriculum that is not always relevant to the Indigenous population (Hunter and Schwab 1998; Schwab 1999). This is not to say that Indigenous Australians would fit neatly into a model designed for the non-Indigenous population. Variation in factors such as access to labour markets, distance to schools, geographical mobility, and information from peers means the parameters in the model may be quite different for the Indigenous population compared to other populations. In addition, a number of researchers have extended the HCM to take into account the non-economic costs and benefits of education. These may also vary for the Indigenous population. Rather, a HCM designed with the Indigenous population in mind may provide a useful way to study Indigenous education outcomes with youths' own agency at the centre of the analysis.

In studying Indigenous education participation using the HCM, there are two main research questions that are examined in this thesis. The first is what are the benefits of education for the Indigenous population? The main outcomes that are focussed on are employment and income; however, there is also analysis of the extent to which those with higher education levels report better health outcomes or more favourable health behaviour. The predicted benefits of education for the Indigenous population are compared against those for the non-Indigenous population. Furthermore, within the Indigenous population, comparisons are made by geography and by population subgroup.

The second main research question is what factors are associated with the decision to attend high school? That is, does the Indigenous population respond to the economic incentives as estimated in this thesis? In addition, other factors at the individual, household and area level are likely to influence the social costs and benefits of education, as well as geographic and financial access. The extent to which these are associated with high school participation is also examined.

To answer these two research questions, this thesis is structured into nine chapters, including this introductory chapter. Chapters 2, 3 and 4 set the scene for the empirical analysis in this thesis including demographic information, the economic model used and the data used to estimate some of the parameters of the model. Chapters 5 and 6 look at the predicted benefits of education and Chapters 7 and 8 examine the factors associated with education participation. Finally, Chapter 9 gives conclusions and recommendations and outlines the contribution this thesis will make to the understanding of Indigenous education and labour market outcomes. These remaining eight chapters are summarised below.

1.2 Context: The demographic, economic and education outcomes of Indigenous Australians

Before looking in detail at the predicted benefits of education for Indigenous Australians and the factors associated with education participation, Chapter 2 provides the context for the thesis. Chapter 2 also presents and discusses the literature that will be used to motivate the empirical estimations in the remainder of the thesis.

The chapter begins by discussing the demographic and geographic circumstances of Indigenous Australians. After identifying the Indigenous population as being relatively young and more likely to live in regional or remote areas compared to the non-Indigenous population, the next part of the chapter looks at migration rates. Given one focus of this thesis is the geographic aspects of education and economic outcomes, an understanding of the patterns of migration is important in interpreting and responding to these empirical results.

The next section in Chapter 2 looks at the economic circumstances of Indigenous Australians, including their employment status and access to income. One important aspect of the employment status of Indigenous Australians that is discussed in Chapter 2 is the Community Development and Employment Projects (CDEP) scheme. The scheme allows Indigenous Australians in certain areas to forego social security benefits and instead receive a form of wages for employment. The way in which access to the CDEP scheme is affected by education has important implications for the benefits of education and hence the motivation to finish high school or complete a qualification.

The final part of Chapter 2 discusses education participation and attainment amongst Indigenous Australians. Three levels of education are focussed on: preschool; late secondary or high school; and post-school qualifications. The results presented in Chapter 2 highlight the continuing low investment in education for the Indigenous population relative to the non-Indigenous population, as well as different ways in which Indigenous Australians complete their studies. Importantly, Indigenous Australians are identified as undertaking and completing education at a later age than the non-Indigenous population. This has a number of implications for the provision of education.

1.3 Developing a human capital model for Indigenous education

The low educational participation rates amongst the Indigenous population that are presented in Chapter 2 have been recognised for a long time and the factors associated with this low participation examined by a number of researchers. There have been few attempts, however, to develop a theoretical model that links the two. In Chapter 3, a theoretical model is developed that explicitly treats the education decision of Indigenous Australians as being based on the relative costs and benefits of studying. The HCM is used as the basis for the model with research from other contexts included to incorporate other aspects of the education decision beyond the economic costs and benefits.

There is also discussion in the chapter of a number of extensions to the basic model. This includes variation in cognitive and non-cognitive ability, unobserved costs of education, uncertainty and other investments related to education such as health and migration. The final part of Chapter 3 discusses the implications of the model and uses it to expand on the research questions outlined in this introductory chapter.

1.4 Data and geography

Chapter 4 discusses the data sources used to generate the empirical results in the remainder of the thesis, as well as the levels of geography that are used in the analysis. There are a number of key characteristics of the data sets used to answer the research questions outlined at the start of this chapter. The three main criteria are:

- a sufficiently large and nationally representative sample of Indigenous Australians;
- information on education attainment and participation; and
- information on key outcomes of interest, including employment status and income.

In addition, a number of secondary criteria are outlined that, although not necessary for all parts of the analysis, are required to answer some of the specific research questions proposed in Chapter 3. The three data sets that best meet the main and secondary criteria are: the 2001 Census of Population and Housing; the 2002 National Aboriginal and Torres Strait Islander Social Survey (NATSISS); and the 2001 National Health Survey (NHS). Each of these is discussed in Chapter 4.

1.5 The predicted benefits of education for Indigenous Australians

The presentation of the empirical results for this thesis begins in Chapter 5 with the predicted benefits of education for the Indigenous population. One factor that people may take into account when deciding whether or not to undertake study is the effect it has on their economic status. Given the potential role of economic incentives in influencing education participation, an understanding of the predicted economic benefits of education will not only test one potential reason for low participation, but will also give some insight into the scope for increased participation in education leading to a reduction in socio-economic disadvantage.

Two of the important economic benefits of education that people are likely to take into account are their ability to obtain employment and, once employed, obtain a job that is relatively well paid. The results presented in Chapter 5 show that the difference in lifetime employment by education was generally higher for the Indigenous population compared to the non-Indigenous population, and females compared to males. When focussing on those who are employed and especially those who are employed full-time, the difference in lifetime income is similar for the Indigenous population compared to the non-Indigenous population, and on occasions less.

In addition to studying the employment and income benefits of education for all Indigenous Australians (and comparing those to the non-Indigenous population) estimates are also given for variation in the predicted benefits of education within the Indigenous population. If Indigenous youth expect themselves to be in a certain population subgroup throughout their lives, then they are more likely to use information from others in that subgroup to determine whether undertaking education is economically worthwhile. For most subgroups, the benefits of education are still positive so this does not take anything away from the role of education in reducing disadvantage. However, there is evidence for variation in economics incentives to complete later years of secondary school.

While employment and income are important aspects of a person's socioeconomic status, there are a number of other outcomes that education might influence. One of these is a person's health status. Individuals may take this into account when making their education decision and hence the final section of Chapter 5 looks at the relationship between high school education and health outcomes and health behaviour.

1.6 The predicted benefits of education by geography

One reason why Indigenous Australians might not necessarily respond to the benefits of education at the national level is that there may be substantial variation in these benefits by geography. If youth and their families rely more heavily on information from individuals in their area to determine how worthwhile education is, then a large proportion of the population may in fact predict relatively low benefits of education. Hence, where there are non-trivial costs to migration, understanding the incentives to undertake education can be aided by estimating the benefits of education at sub-national levels of geography. Chapter 6 presents estimations of the predicted employment and income benefits of education by two geographical breakdowns.

The first set of estimates is by remoteness. Under this classification, Australia is geographically partitioned into major cities, inner regional areas, outer regional areas, remote areas and very remote areas. Separate estimates by this classification show that there are certain types of areas where the predicted benefits of education are relatively high, especially for the Indigenous population.

This first classification does not represent contiguous regions but rather a collection of regions with certain characteristics. To determine whether education is worthwhile, an individual might, however, use information from people in close proximity to them. The second level of geography used in Chapter 6 is therefore much smaller and based on the Statistical Local Area (SLA). Using such an area not only shows that there is quite a large distribution of the benefits of education that Indigenous youth might predict for themselves, but it also allows an estimate of the area-level factors associated with the predicted benefits of education. This shows that there are types of areas that are likely to have relatively low benefits of education and hence any policy responses designed to bolster the economic incentives for Indigenous youth to complete school could be targeted towards them.

1.7 The individual, household and neighbourhood characteristics associated with education participation of Indigenous youth

While there has been some research looking at the predicted economic benefits of education for Indigenous Australians, none have tested empirically how these benefits are associated with education participation. In Chapter 7, an individual-level model is estimated that tests whether the predicted benefits of education are associated with an Indigenous 15 to 17-year-old attending high school. While the results are more consistent for the non-Indigenous populations, some of the benefits of education presented in Chapter 6 are indeed associated with high school education.

In addition to economic incentives, other area-level characteristics are also likely to have an important impact on the decision to attend high school. This includes the social costs and benefits of education, as well as particular labour market programs. Separate estimates are given in Chapter 7 for the association between an individual's probability of attending high school and: the high school attendance rate of their peers; the high school completion rate of older cohorts in the area; and the presence and level of participation in the CDEP scheme in the area.

To be able to accurately interpret the area-level characteristics, it is important to control for other individual and household characteristics and hence a number of these are included in the estimated models. The association with these variables also have their own important policy implications. For example, education levels in the household are shown to have a significant positive association with the probability of attending high school whereas the number of people in the household generally had no association. The number of people per bedroom did, however, have a negative association.

1.8 The development of cognitive and non-cognitive ability: Preschool and non-government school attendance

One factor that is not included in the models estimated in Chapter 7 is a person's cognitive and non-cognitive ability. This is because neither the Census nor any large data set on Indigenous Australians has adequate measures of ability which can be compared against the probability of attending high school. While it is unlikely that the distribution of natural ability across the Indigenous population is any different to the distribution for the non-Indigenous population, by the time a person reaches late secondary school there are a number of external factors that are likely to have had an impact. Chapter 8 looks at two aspects of early school experience that might be related to the development of cognitive and non-cognitive ability, preschool attendance for those aged 3-5 years and attendance in non-government schools for those aged 5 to 17 years.

Quality preschool education can help a child in being ready for the transition to school and can also provide a boost to a child's self esteem. This, and the type of school that a person attends once they begin school, are both institutional mechanisms for developing non-cognitive ability that can be used to support the other informal mechanisms like a supportive and undisrupted family environment. Lower levels of attendance at preschool and non-government schools for Indigenous Australians may therefore be a reason for some of the unobserved variation in high school attendance identified in Chapter 7. By looking at the factors associated with preschool and non-government school attendance, insight will be gained into who may currently be benefiting from these types of schooling, as well as those who may potentially benefit into the future.

1.9 Improving education and labour market outcomes for Indigenous Australians – Conclusions and contribution to the literature

The final chapter of this thesis summarises the main empirical results from Chapters 5 to 8. As outlined in Chapter 9, in answering the research questions posed at the start of Chapter 1, this empirical evidence makes a number of contributions to the literature on

Indigenous education and labour market outcomes. This is in addition to the HCM outlined in Chapter 3, which is the first such model developed for the Indigenous population.

Some of the contributions to the literature include the first estimates of: the income benefits of completing Year 12; the health benefits of education; the economic benefits of education by small geographical areas; and the geographical factors associated with the benefits of education. Other contributions to the literature include the first analysis of: whether the benefits of education are associated with participation; whether other area-level characteristics including the CDEP scheme are associated with participation; the factors associated with preschool attendance; and the factors associated with non-government school attendance. Finally, while the analysis is focussed on Indigenous Australians, a number of these empirical results have not previously been estimated for the non-Indigenous population either.

There are a number of recommendations that flow from these contributions to the literature on Indigenous education and labour market outcomes that are outlined in Chapter 9. There are two types of recommendations given. The first is for those who design or implement public policy related to Indigenous Australians. In recognising that there are still a number of gaps in the evidence base from which such policy conclusions should flow, however, the second set of recommendations is for those who collect data on Indigenous Australians or undertake empirical research using this data.

Chapter 2 Context: The demographic, economic and education outcomes of Indigenous Australians

In order to understand participation in and the potential benefits and costs of education for Indigenous Australians, it is important to be aware of their wider socio-economic status. This chapter synthesises previous research and provides some new empirical results to provide the context and motivation for the remainder of the analysis in this thesis.

Section 2.1 looks briefly at the demographic and geographic circumstances of Indigenous Australians and how they relate to the rest of the population. The next section looks at the economic circumstances of Indigenous Australians including employment status and income. Finally, Section 2.3 presents some descriptive statistics looking at the education participation and attainment of the Indigenous population.

2.1 Demographic and geographic context

2.1.1 Demographic context

One of the biggest differences between the Indigenous and non-Indigenous populations is in their age compositions. Taylor and Biddle (2005) show a very young age composition of the Indigenous population compared to the rest of the Australian population. At the time of the 2001 Census, 39.3% of the Indigenous population were aged under 15 years with a further 18.3% of the population aged 15 to 24. This is compared to 20.4% and 13.6% for the non-Indigenous population. On the other hand, only 6.7% of the Indigenous population were aged 55 years or over compared to 22.0% for the non-Indigenous population.

As the non-Indigenous population is projected to age even further, with increasing shares in the oldest age groups, the Indigenous population looks set to retain its youthful profile. This is because of relatively large numbers of women moving into child-bearing age, combined with high adult mortality and a propensity for children of Indigenous and non-Indigenous parents to identify as being Indigenous (Taylor 2006).

The projections for the Indigenous population to 2009 presented in Taylor and Biddle (2005) suggest a relatively large increase in the population aged between 15 to 19, an age usually associated with late secondary school and early post-secondary studies. There are also predicted to be large increases in the proportion of the Indigenous population in their 20s, when post-secondary studies are usually being completed and individuals are entering the labour force for the first time.

This demographic profile presents two main issues for the analysis in this thesis. Firstly, it is vital that education policy be well designed so as to ensure this cohort of Indigenous Australians stay engaged with and motivated by the education system. However, in areas with a high proportion of the population who are Indigenous, there are going to be increased strains on the resources required to support Indigenous education. This is especially the case for those resources of greater relative need for the Indigenous population and means that any policy to increase participation must be based on solid evidence and minimise the amount of resources required.

2.1.2 Geographic context

In absolute terms, Indigenous Australians are a largely urban population. According to the 2001 Census, there were 125,091 Indigenous Australians in major cities which made up about 30.5% of the total Indigenous population. Added to this, 83,217 Indigenous Australians were recorded in inner regional areas (20.3%) and 94,602 in outer regional Areas (23.1%). This leaves only 8.5% of the population in remote (35,026 people) and 17.5% in very remote (71,881 people) Australia (these figures come from ABS 2002a, however the classification boundaries for the regions are given in Figure 4.1, Chapter 4).

Relative to the non-Indigenous population, however, Indigenous Australians make up a greater proportion of the remote and very remote populations than they do in the major cities and regional areas. Using data from the 2001 Census again, across Australia Indigenous Australians make up 2.3% of the population. However, in major cities the corresponding figure is 1.1%. This rises to 2.2% in inner regional areas, however is higher than the national average in outer regional (5.0%), remote (11.0%) and very remote (38.3%) Australia.

Clearly the provision of education for the Indigenous population will be of particular importance in certain parts of Australia. Furthermore, aspects of geographic isolation that make the provision of education more difficult and costly will be a particularly important explanation for lower rates of Indigenous attendance.

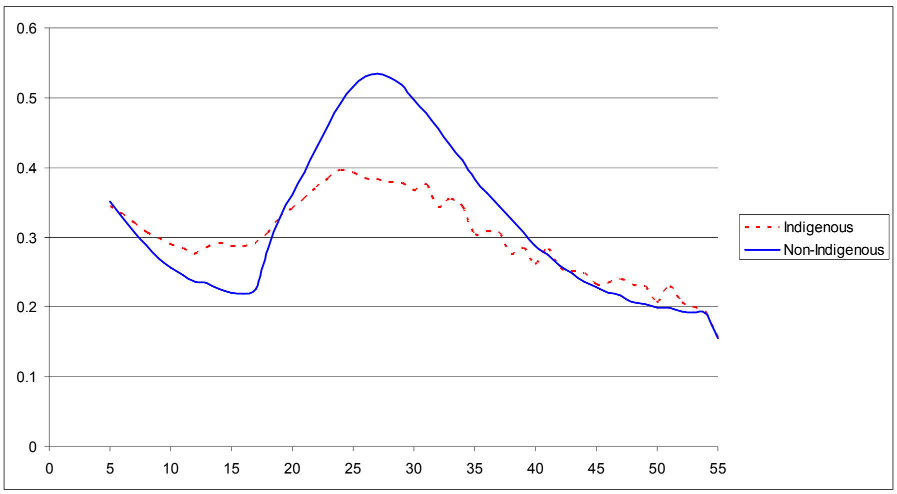
2.1.3 Migration

Along with births and deaths, internal migration patterns are important factors influencing the demographic and economic futures of geographical areas and the people that live in them. Areas with net inward migration may experience greater pressure on the supply of goods and services, whereas those with net outward migration may experience labour shortages and lower levels of consumption of goods and services. From an individual perspective, migration may be an indication of a lack of services in the area a person migrates from as well as an act that involves potentially large costs to be balanced against any benefits. All of these factors are likely to be related to a certain extent to the supply and demand of education in an area.

According to the 2001 Census, 51.3% of the Indigenous population had a different usual residence in 2001 compared to 1996. Of those that did move, 61.9% moved into a different SLA. For the non-Indigenous population, the proportion of those who had changed usual residence was lower at 42.7%. For those who did move, however, a higher proportion of the population had moved SLA (67.1%). That is, Indigenous Australians are more likely to change residences, but of those that do move, they are more likely to move over relatively short distances. In addition to different rates, Indigenous Australians have distinct patterns of mobility.

The following figure outlines the proportion of people that moved SLA in the preceding five years (up until 2001) plotted by age and calculated separately for Indigenous Australians (the broken red line) and non-Indigenous Australians (the unbroken blue line).

Figure 2.1 Age distribution of the predicted probability of moving SLA in the last 5 years



Source: Biddle and Hunter (2006a) using the 2001 Census

The general shape of the distribution is similar for Indigenous and non-Indigenous Australians. For both populations, the probability of moving areas up until age 5 is reasonably high. The probability then declines until around age 15, increases quite substantially for the next ten years or so, then declines. There are, however, differences between the two populations.

The Indigenous population maintains a much higher probability of moving throughout infants and primary school, as well as into the teenage years. For the non-Indigenous population, migration rates may decline through these years in order to avoid disrupting schooling or the development of peer social networks within the school. That the Indigenous rates do not decline by as much could be both a consequence of relatively low engagement with formal schooling as well as being the cause of lower attendance and higher truancy.

Whilst staying somewhat lower throughout the teenage years, the probability of moving SLAs is much higher during the peak migration years of around 20 to 35 years for the non-Indigenous population. This is the age at which the non-Indigenous population move out of home, begin a career and start a family (Long 1992). It would appear, therefore, that such life-cycle events have much less of an impact on the migration patterns of Indigenous Australians than they do for the non-Indigenous population.

Biddle and Hunter (2006a) looked at the patterns of migration between the 36 Aboriginal and Torres Strait Islander Commission (ATSIC) regions as the basis of the analysis.[4] For the non-Indigenous population, there were 12 ATSIC regions with a greater than 10% net out-migration. That these were mainly in remote areas and there are fewer regions that had large net out-migration amongst the Indigenous population, only Bourke had out-migration of greater than 10%, shows that remote Australia is becoming relatively more Indigenous through time (Taylor 2006). As these figures do not include births (that is, they only include those who were alive and in Australia in both 1996 and 2001), the higher fertility rate of the Indigenous population means that the overall change in population may be greater still.

Biddle and Hunter (2006a) also show that Brisbane, Perth and to a lesser extent Sydney, Darwin and Adelaide are pulling in the majority of non-Indigenous internal migrants. That these larger cities also receive the majority of overseas migration will further increase the population in these regions. Compared to non-Indigenous migration, the destinations of choice for the Indigenous population are less likely to be the capital cities.

Because of the high level of migration for the Indigenous population, schools need to take into account the potential disruption to a child's education. Furthermore, the patterns

[4] Using such a broad geographic area of course hides the large number of moves that occur within ATSIC regions.

of migration show that remote and regional Australia is likely to see an increase in the proportion of the Indigenous population into the future. Schools in these areas should make sure they are well prepared to take advantage of the unique perspective Indigenous children bring to their education, as well as be prepared to meet their unique needs.

2.2 Economic context

One of the major benefits of education and a reason often given for devoting more resources to increase Indigenous participation is the potential improvements in economic outcomes. While this thesis shows variation within and between the Indigenous and non-Indigenous populations, in general those with higher levels of education have higher incomes (Daly 1995) and a higher probability of being employed (Hunter 2004; Biddle and Webster 2007) than those with lower levels of education. Chapter 3 outlines a model that more formally links economic outcomes to education; however, before then it is important to document the overall economic circumstances of Indigenous Australians.

This section begins by outlining in broad terms the labour market characteristics of Indigenous Australians then discusses the CDEP scheme and its importance in any analysis of Indigenous outcomes. Research looking at the factors associated with employment outcomes is then summarised, while the final part of the section looks at the income of Indigenous Australians.

2.2.1 The labour market

As shown previously, Indigenous Australians live across quite varied geographies and therefore differ quite substantially in their proximity to what might be referred to as ‘mainstream’ labour markets. The Indigenous population who live in non-remote areas are likely to be exposed to the same range of job opportunities as non-Indigenous Australians and for the most part are likely to have to compete with non-Indigenous Australians for the available jobs. However, for a number of reasons including low levels of formal education, different language skills, previous exposure to the criminal justice system and (potentially) discrimination from prospective employers (Hunter 2004), Indigenous Australians may not be able to fully make use of these labour markets. For this reason unemployment rates for Indigenous Australians are quite high and range from 25.2% in major cities to 30.0% in inner regional areas and 29.1% in outer regional areas (Altman, Gray and Levitus 2005).

For Indigenous Australians in more remote areas, there are far fewer jobs available though perhaps less competition from non-Indigenous Australians for those that are. In part to compensate for the lack of jobs, in a number of areas the CDEP scheme provides an alternate form of employment. If those in CDEP employment are classed as being employed then unemployment rates in remote areas are much less than those in non-remote areas (17.2% in remote Australia and 7.0% in very remote Australia). If, on the other hand, CDEP participation is counted as being unemployed, then rates in very remote Australia increase to 75.7% and remote Australia to 46.0% (Altman, Gray and Levitus 2005).

The next section looks in more detail at the CDEP scheme.

2.2.2 The CDEP scheme and its influence on Indigenous employment

The perceived need for the CDEP scheme arose in the mid 1970s as the payment of unemployment benefits increased in remote Aboriginal communities where there were few formal employment opportunities (Sanders and Morphy 2001). The scheme allows (primarily) Indigenous Australians to forego social security benefits and instead receive a form of wages for employment.

The CDEP scheme began as a small pilot scheme in the Northern Territory in 1977 in 12 remote Aboriginal communities. The scheme’s first objective was given as being:

> To provide employment opportunities thereby reducing the need for unemployment benefit for unemployed Aboriginals within the community at a cost approximating unemployment benefits (Commonwealth Parliamentary Debates, House of Representatives, 26 May 1977, p.1922. Taken from Sanders 1997).

In the early 1980s the scheme began expanding quite rapidly. By 1985, 38 Aboriginal communities had joined the scheme, with a total of 4 000 participants. At that time, the budget for the scheme was $27 million, representing approximately 9% of Aboriginal Affairs portfolio expenditure (Sanders 1997). In 1991-92, the scheme had expanded to 200 Indigenous communities, involved around 20 000 participants and accounted for a third of the ATSIC budget. By 2000-01, the scheme expanded to 35,400 participants and accounted for about 38% of the ATSIC budget.

Although the increase in the CDEP scheme since its inception in 1977 has seen it expand into more urban areas (Hunter 2003), the CDEP scheme is still much more common in remote and to a lesser extent regional areas. Furthermore, recent changes to the scheme (DEWR 2006) will likely change the focus back to remote areas.

According to customised data from the 2002 NATSISS, of those in remote or very remote Australia, almost a third of the total Indigenous population and over 60% of the employed population are employed in the CDEP scheme. Multiplying this by the number of Indigenous Australians in each of the respective areas shows that around 25,000 of the 34,000 people employed in the CDEP scheme live in remote or very remote Australia.

One of the important aspects of the CDEP scheme from the point of view of this thesis is the way in which CDEP employment is distributed by educational attainment. This is demonstrated by the following table which gives the percentage of the population in three employment categories by three levels of high school completion. The fourth line of figures in the table is for those who are still high school students, whereas the final line of the table is the proportion of the total Indigenous population aged 15 years and over by employment category.

Table 2.1 High school completion by CDEP employment – Indigenous population aged 15 years and over, 2002

	Not employed	Employed – CDEP	Employed – Non-CDEP	Population
Year 9 or below	66.15	12.98	20.87	108,086
Year 10 or 11	46.27	13.76	39.97	107,866
Year 12	31.70	10.79	57.51	47,006
Still a student	80.58	1.46	17.96	19,247
Population	53.79	12.13	34.08	282,205

Source: Customised data from the 2002 NATSISS

Table 2.1 shows that the percentage of the total Indigenous population who are employed in the CDEP scheme stays reasonably constant as the level of high school completion increases. However, because the percentage of those in non-CDEP employment increases quite substantially, the proportion of the employed population who are in the CDEP scheme decreases quite substantially.

The CDEP scheme is predominantly part-time (Hunter 2004). According to Biddle and Webster (2007), those in CDEP employment are much more likely to work 16-20 hours than those in non-CDEP employment. Indeed, over half of the population employed in the CDEP scheme report the above range of hours per week compared to 5.7% for male non-CDEP workers and 13.9% for female non-CDEP workers. There are still, however, a reasonably large minority of people who identify as being employed in the CDEP scheme who work more than 35 hours per week (18.4% for males and 13.3% for females). This full-time work is unlikely to be entirely on the CDEP scheme, but rather through combining CDEP with other employment.

Clearly, the characteristics of CDEP employment are quite different to non-CDEP employment and hence where possible, when modelling Indigenous employment, a distinction should be made between the two. Unfortunately, for a large part of Australia, the Census does not separately identify CDEP employment from non-CDEP employment. Hence any analysis of employment outcomes using the Census in this thesis is going to include both two together. However, the former ATSIC collected administrative data on CDEP participation which Biddle and Hunter (2006b) used to estimate CDEP participation at the SLA level. This data is outlined in more detail in Chapter 4.

2.2.3 Factors associated with Indigenous employment

One of the main focuses of this thesis is how a person's education participation is associated with their employment status and, in the model to be outlined in Chapter 3, it is assumed that this forms one of the motivations for completing high school or other education. However, there are a number of other factors that are associated with whether or not a person is employed, and for those who are employed, the type of employment. While these factors are not the main focus of this thesis, it is important to understand these patterns in order to put the education/employment relationship into context, as well as to see whether the association with education remains after controlling for other characteristics of the individual.

Two relatively recent studies have looked at the factors associated with Indigenous employment using the 2002 NATSISS. Biddle and Webster (2007) used a sequential choice model with the simplifying assumption that employment outcomes are determined by a hierarchy of decisions. The first decision is whether or not to be in the labour force. The second decision is whether to be employed or unemployed for those who are in the labour force. For those who are employed, the final decision is then whether or not to be employed in the CDEP scheme as opposed to non-CDEP employment. The decisions are assumed to be made jointly by the individual, potential employers and the government in the area. That is both labour supply and labour demand are important. The second paper, Halchuk (2006), only looked at the probability of being employed, excluding those employed in the CDEP scheme from the analysis. However, a separate set of estimates were carried out by sex and remoteness classification testing whether the relationships varied.

In both papers, a person's education level has a strong association with their labour market outcomes, even after controlling for a range of other characteristics of the individual and the area in which they live. In Biddle and Webster (2007) those with higher education levels (especially degrees and other qualifications) are much less likely to be not in the labour force, unemployed and for those who are employed, less likely to be employed in the CDEP scheme. Participation in education also has a strong association; however, those studying part-time often have different outcomes compared to those studying full-time. That is, those who are studying part-time appear to be doing so to balance work and study commitments as they are less likely to be not in the labour force and less likely to be unemployed. Halchuk (2006) found reasonably inconsistent results across remoteness classification and sex in the association education has with employment probabilities. For example, the association between completing Year 10 (as opposed to Year 8 or less) and employment for males in remote Australia was in fact negative.

In Halchuk (2006) and Biddle and Webster (2007), having been arrested in the five years preceding the survey was positively associated with whether or not a person was unemployed (of those in the labour force) and for those who are employed whether or not they were employed in the CDEP scheme. Similar results were also found in Hunter and Borland (1999) using an earlier version of the survey; however, these authors also took into account the possibility that arrest and employment are jointly determined. Biddle and Webster (2007) found that for those who had been arrested, having been incarcerated was positively associated with being unemployed, but interestingly was insignificant for the other three estimations.

In addition to the characteristics of the individual, Biddle and Webster (2007) also found that the characteristics of the area in which they lived were also found to be associated with employment outcomes. The employment and unemployment levels in the SLA a person lived in had a significant association with a person's own labour market outcomes, even after controlling for a range of individual characteristics. Those in high unemployment or low employment areas were much more likely to be not in the labour force and unemployed themselves. The magnitude of the association with being employed in the CDEP scheme was, however, smaller.

Ross (2006) used the NATSISS to look at the factors associated with employment. However, the focus in that paper was on the relationship between self-assessed health and employment. The author found that not only is there a negative relationship between health and employment, but also that this relationship appears to get stronger as health deteriorates further. That is, the predicted difference in the probability of being employed between someone with excellent health compared to someone with very good or good health is smaller than the difference between someone with fair or poor health. While this may be because of the way in which the five-category self-assessed health variable is interpreted by respondents, it does nonetheless show that those who report low health are substantially less likely to be employed.

2.2.4 Income and access to other resources

In addition to being able to obtain employment, the introductory chapter also identified the effect of education on income as being a motivation for a person attending high school or post-school education. Partly because of the employment patterns presented previously, Indigenous Australians have lower income on average than non-Indigenous Australians. In 2002, mean equivalised household income was $394 for Indigenous Australians compared to $665 for non-remote, non-Indigenous Australians (ABS 2004a).[5] While this figure is reasonably stark, there are a number of complicating factors that need to be understood before analysing the relationship between income and education.

The first set of issues is the way in which income is earned and spent. That is, Indigenous Australians earn their income from different sources and have different spending patterns than the rest of the Australian population. As the discussion in Section 2.2.2 showed, a reasonably large proportion of Indigenous Australians are employed in CDEP

[5] Equivalising income takes into account the fact that an additional person in the household costs less than the first because of the potential to share resources. These figures use the OECD equivalence scale which assumes an additional adult costs 0.5 times as much and an additional child costs 0.3 times as much as the first adult.

employment. It is not surprising therefore that, according to the 2002 NATSISS (ABS 2004a), a reasonably large number of people (10.9% of the population aged 18 years and over) reported earnings from the CDEP scheme as their main source of income. A further 30.6% of the Indigenous population reported that other wages and salaries were their main source of income. In addition to the CDEP scheme, another way in which Indigenous Australians earn income that differs from non-Indigenous Australians is through payment for participation in cultural activities (Altman, Buchanan and Biddle 2006)

Although income from CDEP employment is important, more than half of the Indigenous population report that government pensions and allowances were their main source of income (51.7% of the Indigenous population aged 18 years and over). This is likely to be made up of unemployment benefits (in areas without the CDEP scheme) and disability support pensions. The figure for the Indigenous population is much higher than the total population who report such sources (27.1%, according to ABS 2004a). These differences in the way in which income is earned will provide an important part of the explanation for a number of results presented later in this thesis, in particular the relationship between education and income. That is, the low levels of education for the Indigenous population are likely to have a strong influence on the potential sources of income for the Indigenous population. However, the potential sources of income (to the extent that they are influenced by things other than education) are also likely to influence the incentive to undertake education in the first place.

Indigenous Australians are likely to spend what income they do receive on a different range of goods and services than non-Indigenous Australians. One of the reasons for this may be differences in preferences which, although interesting in and of themselves, will not have much of an influence on the interpretation of results in this thesis. One possible reason for different spending patterns that is perhaps more relevant is the prices of goods and services. That is, as documented by Saunders et al. (1998) and Chapman and Greenville (2002), there are quite substantial differences in the cost of living across Australia. While house prices are quite high in many parts of Australian cities, because of high transport costs the price of a number of other goods and services (including fresh fruits and vegetables) increase as one gets further away from the major cities. This last point has been documented by the Northern Territory Government (2004). So, when comparing the level of income between someone in remote compared to non-remote Australia, for example, it should be kept in mind that one person's income may constitute access to a different range of resources compared to another's.

This leads to the second set of issues for income which revolve around the adequacy of income as a measure of access to resources. That is, Indigenous Australians often have access to resources that most non-Indigenous Australians do not (through, for example, hunting, gathering and fishing) but on the other hand are less likely to have access to the stock of wealth a large proportion of the rest of the Australian population do.

Wage and salary employment, income from one's own business and receipts from the government are the main sources of cash income for Indigenous (and non-Indigenous) Australians. There are, however, other ways in which individuals access resources that have an economic value, including fishing, hunting or gathering of bush food. These activities make up a large part of the 'customary' economy and interact and often overlap with the other two components of the hybrid economy outlined in Altman (2005), being the state and the market. While the social aspects of these activities should not be overlooked, Gray, Altman and Halasz (2005) give evidence that even in non-remote Australia, they can make up a large proportion of a person's livelihood.

Unfortunately there is no nation-wide data that quantifies the monetary value of such activities. The 2002 NATSISS does, however, give evidence on the number of people in parts of remote and very remote Australia who reported that they fished or hunted in a group (with results reported in Altman, Buchanan and Biddle 2006).[6] From the relevant sample aged 15 years and over, 82.4% answered that they fished or hunted in a group in the past three months. This represented 39 400 Indigenous Australians. A slightly higher,

[6] Unfortunately this question is only asked of those in Community Areas. As such, results are not necessarily representative of all of remote and very remote Australia, nor is there any information on the rest of the Indigenous population.

though not significantly different, proportion of males reported that they fished or hunted in a group than females (84.0% compared to 80.8% respectively). There was no difference between those aged 15 to 34 years (84.2%) and those aged 35 to 54 years (84.9%). There was, however, a significant difference between the proportion of those aged 55 years and over who said they participated (66.7%) compared to the rest of the population.

This participation in fishing, hunting or gathering bush foods suggests that for a number of Indigenous Australians focussing on cash income may understate their access to economic resources. This may especially be the case for those who do not work or who work part-time. Compared to this, lower levels of home ownership and wealth accumulation may have the opposite effect. In Australia, owning one's own home provides a store of wealth that can be drawn upon when income is relatively low and can provide funds during a person's retirement. Furthermore, it can be used as a source of collateral to raise money towards the purchase of other economic assets and is one of the main ways in which wealth is passed on to future generations.

According to ABS (2004a), 26.5% of Indigenous Australians in 2002 lived in a house which is either owned without a mortgage (10.0%) or owned with a mortgage (16.5%). This proportion is substantially lower than the 73.1% of non-Indigenous Australians who live in such houses. There was a fair bit of difference within the Indigenous population, with only 8.6% of remote Indigenous Australians reporting that they own or are purchasing their own homes compared to 33.4% of non-remote Indigenous Australians.

2.3 Education context

The previous two sections have shown that the Indigenous population is relatively young and, although primarily living in urban or regional areas, also more likely to live in remote or very remote Australia compared to the non-Indigenous population. Indigenous Australians are less likely to be employed than the non-Indigenous population; however, the CDEP scheme in part compensates for the lack of employment opportunities in remote and very remote Australia. Indigenous Australians receive on average a lower income than the non-Indigenous population; however, the way in which income is earned and spent also differs quite substantially. In Chapter 3 a theoretical model is outlined that links these outcomes with education participation and in Chapters 5 to 8 some of these relationships are estimated empirically. Before looking at these relationships though, this section documents the level of educational attainment and participation for the Indigenous population.

Although there is some overlap with the ages at which people usually participate in each sector, there are four main sectors of education analysed in this thesis. These are:

- preschool and early childhood education (for those aged 3 to 5 years);
- infants and primary school (aged 5 to 11 or 12 years), compulsory high school (aged 11 or 12 to 14 years) and post-compulsory high school (aged 15 to 17 or 18 years);
- vocational education and training (Certificates and Diplomas for those aged 15 years and over)
- universities (degrees and post graduate qualifications generally for those who have completed Year 12 or equivalent).

The following graph shows the relative level of participation in education for the Indigenous population aged between 3 and 55 years. The graph is constructed by first estimating the proportion of Indigenous and non-Indigenous Australians who reported that they were attending any type of institution. Possible institutions range from preschool to universities, and both full-time and part-time students were included. Once these proportions are calculated, the ratios of the Indigenous to non-Indigenous figures are then graphed.

Figure 2.2 Ratio of Indigenous to non-Indigenous attendance at any educational institution – 2001

Source: Customised data from the 2001 Census

The above graph shows that educational attendance for Indigenous Australians starts off relatively close to the non-Indigenous population, although even at this young age (3 to 5 years), a disparity is already apparent. During the compulsory school ages (6 to 14 years), reported attendance is equal to that of the non-Indigenous population. However, truancy and absenteeism is a substantial issue for this age range, and as such actual attendance may be quite a bit different.

Once individuals are legally allowed to leave school, however, the relative attendance rates drop off quite substantially. They decrease to such an extent that for those aged 20 and 21 years the Indigenous attendance rates are about a third of their non-Indigenous counterparts. After reaching this low, the relative attendance rates then increase steadily such that by age 32 for females and 36 for males, a higher proportion of Indigenous than non-Indigenous Australians are attending an educational institution. The higher attendance at older age groups no doubt reflects a catch-up by the Indigenous population, as by this age most non-Indigenous Australians who are going to obtain qualifications have already done so.

The following sections look in more detail at the current patterns of educational attainment and then the current patterns of attendance. This information is then combined to look at the age at which Indigenous Australians are currently undertaking education and the age at which they undertook education in the past.

2.3.1 Current patterns of attainment

Indigenous Australians have lower levels of both high school completion and post-school qualifications than the non-Indigenous population, with Indigenous males being the least likely to have completed either Year 10 or Year 12, but Indigenous females the least likely to have obtained post-school qualifications. There is, however, substantial variation within both populations as shown by the following table that gives the percentage of the population who have completed Year 10 or 11 only as well as the percentage of the population who have completed Year 12. The final three columns give the percentage of the population whose highest qualification is a certificate, a diploma or a degree (including those with higher degrees) respectively. The percentages exclude those who are still at school and are calculated separately for Indigenous and non-Indigenous males and females, as well as separately by age and the remoteness classification that the person currently lives in.

Table 2.2 Percentage of population 15 years and over by educational attainment, sex and Indigenous status – 2001

	High school completion		Highest qualification		
	Year 10	Year 12	Certificate	Diploma	Degree
Indigenous males					
Aged 15 to 24	44.14	23.92	10.18	0.71	0.86
Aged 25 to 34	45.29	25.44	18.55	2.60	3.29
Aged 35 to 54	41.00	12.90	17.79	3.46	4.10
Aged 55 and over	15.30	7.28	10.44	1.74	2.24
Major city	44.24	26.18	20.18	3.68	5.42
Inner regional	42.90	19.48	19.41	2.47	3.02
Outer regional	42.61	19.25	14.97	2.10	1.78
Remote	41.52	13.25	12.10	1.19	1.19
Very remote	28.75	8.47	4.91	0.79	0.44
Total population	40.38	18.80	15.15	2.31	2.81
Indigenous females					
Aged 15 to 24	45.06	28.51	8.93	1.37	1.54
Aged 25 to 34	48.34	26.79	10.29	4.08	5.29
Aged 35 to 54	45.89	12.92	7.91	5.54	5.93
Aged 55 and over	16.40	6.12	2.62	2.58	2.79
Major city	44.16	27.63	10.76	5.23	7.39
Inner regional	46.26	20.21	10.03	4.17	4.46
Outer regional	47.92	19.46	8.58	3.48	3.12
Remote	45.61	14.89	6.31	3.02	2.84
Very remote	30.60	10.07	2.52	1.47	1.03
Total population	43.04	20.06	8.21	3.75	4.29
Non-Indigenous males					
Aged 15 to 24	36.36	55.41	16.76	3.45	6.87
Aged 25 to 34	38.01	55.12	29.25	6.82	19.89
Aged 35 to 54	42.91	41.76	30.22	7.45	18.58
Aged 55 and over	30.73	28.27	26.49	6.12	10.03
Major city	34.36	48.78	25.70	7.03	17.94
Inner regional	44.21	31.71	30.73	5.43	9.51
Outer regional	44.68	29.66	28.82	4.71	7.85
Remote	46.97	30.49	29.51	4.74	7.71
Very remote	45.12	33.48	31.73	5.58	9.78
Total population	37.76	42.87	27.17	6.42	14.93
Non-Indigenous females					
Aged 15 to 24	28.49	65.51	13.25	5.47	11.36
Aged 25 to 34	32.20	62.28	13.75	9.73	25.64
Aged 35 to 54	44.90	40.71	11.33	9.36	19.19
Aged 55 and over	34.20	21.55	6.03	5.95	7.57
Major city	33.98	47.35	10.43	8.37	18.23
Inner regional	43.76	33.65	11.17	7.27	11.85
Outer regional	44.08	33.19	10.34	6.73	11.42
Remote	44.51	37.00	10.47	7.18	13.30
Very remote	42.21	40.48	10.19	8.25	16.19
Total population	37.16	42.99	10.57	7.97	16.19

Source: Customised data from the 2001 Census

The proportion of the Indigenous population who have completed Year 10 or 11 (but not Year 12) stays reasonably constant across the first three age groups presented, then decreases quite substantially for those aged 55 and over. The proportion of the population who have completed Year 12, however, decreases beyond the age of 35. For the non-Indigenous population, the declines beyond these ages are not as dramatic showing that although the levels of attainment for the relatively young are a fair bit lower than for the non-Indigenous population, historically the differences were even greater still. Looking at the total population, of those with some form of qualification, Indigenous Australians are relatively more likely to have a certificate rather than a diploma or a degree. For the non-Indigenous population, the peak age for having a degree is 25 to 34 years, whereas for the Indigenous population it is 35 to 54 years.

For the Indigenous population, high school completion decreases as the area gets more remote. The decline in completing up till at least Year 10 is particularly pronounced between remote and very remote areas; however, the percentage of the population who has completed Year 12 also decreases substantially between major cities and inner regional areas. For the non-Indigenous population, however, although there is a substantial difference in the percentage of the population who have completed Year 12 in major cities compared to the rest of Australia, there is no real decline between regional areas and remote Australia, or remote and very remote Australia. So, although there is still a disparity in high school completion in major cities between Indigenous and non-Indigenous Australians, the disparity is much greater in remote and very remote Australia. The decline in the percentage of the population with post-school qualifications for Indigenous Australians across the remoteness classifications is greater than both the decline for the non-Indigenous population, and the decline in high school attainment.

2.3.2 Current patterns of attendance – Preschool

The first form of education that a number of children experience is preschool. A good quality preschool experience can improve school readiness and help in the development of cognitive and non-cognitive ability (Heckman, Stixrud and Urzua 2006). If one part of the population has less access to quality preschools, then this is likely to lead to poorer school outcomes into the future.

The following table looks at the participation in early childhood education by Indigenous status as of the 2001 Census. Looking at the 3, 4 and 5-year-old population separately, as well as those aged 4 to 5-years separately (the most common age for preschool attendance) the table breaks each age group down into those that reported attending preschool, those at infants or primary school and those who were not attending any type of educational institution. Indigenous and non-Indigenous data are shown in separate columns with the ratio between the two presented in the final column.

Table 2.3 Percentage of 3 to 5-year-olds by type of educational attendance and age

Age	Type of institution attending	Indigenous	Non-Indigenous	Ratio
3 years	Preschool	20.54	23.95	0.86
	Infants/primary school	0	0	n.a.
	Not attending any school	79.46	76.05	1.04
4 years	Preschool	46.06	57.12	0.81
	Infants/primary school	6.63	5.36	1.24
	Not attending any school	47.31	37.52	1.26
5 years	Preschool	31.91	33.97	0.94
	Infants/primary school	52.40	58.08	0.90
	Not attending any school	15.69	7.95	1.97
4 to 5 years	Preschool	38.85	45.38	0.86
	Infants/primary school	29.97	32.10	0.93
	Not attending any school	31.18	22.52	1.38

Source: Customised data from the 2001 Census

Table 2.3 shows that pre-school attendance increases with age. Not surprisingly, the proportion of children who are attending infants/primary school increases, but so too does the rate of attendance at preschool (for those not at school). However, the disparity between Indigenous and non-Indigenous attendance is also larger the older the child. That is, the ratio of Indigenous to non-Indigenous Australians who are not attending any school increases from 1.04 at age 3 to 1.26 for those aged 4 and then 1.97 for those aged 5.

Not all preschool education has the same effect on a child’s development. Like anything, a quality preschool education is more likely to be beneficial; however, poor quality preschool may in fact have a negative effect on child outcomes. A number of characteristics of quality preschool education were outlined by Raban (2000). Although the list was not exhaustive, it does provide a useful starting point. Some of these characteristics were:

- more highly qualified staff;
- lower child-staff ratios/smaller group sizes; and
- low staff turn-over.

To this list could be added:

- more experienced staff (that is in addition to their qualifications);
- staff with higher motivation or morale; and
- preschools that were well resourced.

The above characteristics are likely to affect quality regardless of the type of children that are attending. Indigenous students are, however, likely to benefit from additional characteristics. In addition to the above therefore, the following are also likely to be associated with a quality preschool experience for Indigenous children specifically (as outlined in Butterworth and Candy 1998):

- staff who are familiar with Indigenous issues and/or curriculum and methodology tailored to Indigenous needs;
- an Indigenous presence in the preschool, especially staff with an Indigenous background; and
- a greater number of staff familiar with local issues.

Unfortunately, there is no national data to examine the extent to which Indigenous or non-Indigenous Australians experience quality education as defined by the above. The Census does, however, provide information on those individuals who identify themselves as working in the preschool industry, including the geographical area in which they work.

This information can give some indication of the quality of the preschools, especially those aspects of quality that are concerned with staffing issues.

Information from the Census on preschool quality is presented in the following table, constructed as follows. Firstly, each individual who identified as working in the preschool industry (henceforth a preschool worker) is allocated to a SLA based on where they worked. The average characteristics for these preschool workers are then calculated weighted first by the number of Indigenous preschool children in the area and secondly by the number of non-Indigenous preschool students. The final column gives the ratio of the Indigenous to non-Indigenous figures. The first variable measures the percentage of Indigenous and non-Indigenous children who live in an area with at least one preschool worker who is Indigenous. The other six variables measure the weighted proportion of workers in the area who have that particular characteristic.

Table 2.4 Characteristic of preschool workers, weighted by Indigenous and non-Indigenous preschool students in the area – 2001

Characteristic of worker	Indigenous	Non-Indigenous	Ratio
Indigenous	30.06%	18.66%	1.61
Aged 35 and over	58.94%	61.08%	0.96
Works full-time	48.34%	44.67%	1.08
Has a degree	26.05%	26.89%	0.97
Has a degree or other qualification	65.46%	69.44%	0.94
Has an income of $400 per week or more	57.79%	56.03%	1.03
Has not moved in the last five years	52.23%	54.96%	0.95

Source: Customised data from the 2001 Census

According to the table, 30.06% of Indigenous preschool students live in an area where an Indigenous preschool worker works. On the other hand, only 18.66% of non-Indigenous preschool students lived in such an area giving a ratio of the two figures of 1.61. This difference is of course not surprising. Indigenous workers are more likely to live in areas where other Indigenous Australians live and most preschool workers are likely to work close to the SLA in which they live. Although the relativities are not surprising, that almost 70% of Indigenous preschool students may not have an Indigenous preschool worker in their area (let alone their school) shows that even from a young age, having an Indigenous role model in a formal education setting is not the norm.

The remaining measures of quality are likely to benefit Indigenous and non-Indigenous roughly equally. Of these, three are more likely to occur in areas where non-Indigenous preschoolers live. That is, preschool workers as experienced by non-Indigenous preschoolers compared to Indigenous preschoolers are on average: older (and therefore more experienced); better educated (both in terms of degrees and other qualifications); and have lived in the same area for at least five years (and therefore more likely to be familiar with local issues).

On the other hand, Indigenous preschoolers are more likely to live in areas with highly paid and full-time workers. This could represent the extra pay that is required to entice preschool workers to the areas in which a high percentage of Indigenous Australians live, either through offering more hours or higher wages.

2.3.3 Current patterns of attendance – High school

The most recent data on high school education comes from ABS (2006a). As this publication is based on administrative data sources there is no information on those who are not attending education and hence one is not able to estimate the proportion of the population in a given age group who are attending high school. Nonetheless, ABS (2006a) does give information on apparent retention rates where an apparent retention rate expresses those enrolled in a particular year level (say, Year 12 in 2005) as a proportion of the same cohort who were enrolled in the base year level (say, Year 7 in 2000).[7] ABS (2006a) calculates retention rates using Year 7 as the base year for New South Wales, Victoria, Tasmania and the Australian Capital Territory and Year 8 as the base year for the other four states and territories.

[7] One potential issue with using apparent retention rates to measure differences in high school completion for the Indigenous population is that, if there are higher rates of Indigenous identification for those in Year 12 compared to Year 7, then this will lead to an upward bias in the estimates of Indigenous retention. This is in addition to the more general issues of mobility and the fact that those who are in Year 12 at the time of counting are assumed to complete Year 12 when some may drop out after this time (Rossiter and Duncan 2006).

In 2005, the apparent retention rate to Year 10 for Year 7/8 Indigenous students was 88.3%. Although this was somewhat higher than the figure of 83.3% recorded in 1998, it was still well below that for the non-Indigenous population (98.6%). The difference between Indigenous and non-Indigenous Australians increases with higher year levels such that the retention rate to Year 12 of 39.5% is substantially below the 76.6% recorded for the non-Indigenous population (ABS 2006a).

2.3.4 Current patterns of attendance – Vocational education and training and university

For a number of people, vocational education and training is seen as a more attractive alternative to high school education. In addition, a number of people who complete high school obtain post school qualifications either at a Tertiary and Further Education (TAFE) institution or a university. The following table presents the percentage of the population who are attending vocational education and training or university. The percentages exclude those who are currently at high school and are calculated separately for Indigenous and non-Indigenous males and females, as well as by age group, remoteness and whether or not the person completed Year 12.

Table 2.5 Percentage of the population attending university or other post-secondary institutions by age, remoteness, Year 12 completion and Indigenous status

	Male		Female	
	University	Other post-secondary	University	Other post-secondary
Indigenous				
Aged 15 to 24	3.31	10.12	6.15	9.58
Aged 25 to 34	2.81	4.70	4.34	5.38
Aged 35 to 54	2.03	3.65	3.45	5.03
Aged 55 and over	0.45	1.53	0.87	2.05
Major city	4.43	6.47	6.65	6.17
Inner regional	2.73	7.74	4.60	8.85
Outer regional	1.76	6.09	3.13	6.93
Remote	0.88	4.12	2.63	4.34
Very remote	0.39	1.44	0.83	1.77
Completed Year 12	8.66	7.42	12.38	6.99
Not completed Year 12	1.19	5.13	2.16	5.80
Total population aged 15 and over	2.40	5.41	4.04	5.87
Non-Indigenous				
Aged 15 to 24	20.02	14.44	26.44	10.99
Aged 25 to 34	6.54	4.03	6.79	4.38
Aged 35 to 54	2.29	2.03	2.92	3.18
Aged 55 and over	0.31	0.47	0.33	0.53
Major city	6.18	3.93	6.83	3.58
Inner regional	3.00	3.52	4.04	3.71
Outer regional	1.96	2.71	3.14	3.51
Remote	1.28	2.17	2.40	3.45
Very remote	1.52	1.61	2.76	2.73
Completed Year 12	10.48	4.69	12.14	4.76
Not completed Year 12	0.99	3.03	1.32	2.87
Total population aged 15 and over	4.96	3.67	5.82	3.59

Source: Customised data from the 2001 Census

Note: Excludes those who are currently attending high school

Looking at the total population aged 15 years and over, although the Indigenous population is less likely to be attending university, they are more likely to be attending other post-secondary institutions. While this is true for the oldest three age groups, for those aged 15 to 24 years, the Indigenous population has lower attendance rates for both forms of post-secondary education.

The proportion of the populations attending post-school education decline by remoteness classification, however within each remoteness classification the difference between the Indigenous and non-Indigenous rates of attendance are not large. This implies that the distribution of the Indigenous population across the remoteness regions (as outlined in Section 2.1.2) is causing a large part of the difference in attendance.

Those who have completed Year 12 are, not surprisingly, more likely to be attending post-school education, especially university. Interestingly though, those Indigenous Australians who have not completed Year 12 are more likely to be attending both forms of post-secondary education than the non-Indigenous population. This implies that, at least to a certain extent, Indigenous Australians are choosing other forms of education as an alternative to high school.

2.3.5 The age at which Indigenous Australians undertake qualifications

This section looks at the age at which Indigenous Australians undertake post-school education, beginning with current patterns of attendance and how certain characteristics vary by a student's age. It is important to have a detailed understanding of the ages of the current student population and how this might vary by population subgroup for a number of reasons. Firstly, to improve the provision of educational services and support. If a student population is made up of a relatively old population, then the curriculum and teaching style might need to be changed accordingly and income support may need to be differentially targeted (i.e. less reliance on parental income as a means test). Furthermore, things like childcare and part-time options become more relevant than, say, sporting facilities.

A second reason is that doing so may shed light on reasons for overall low participation rates. That is, if it is the case that attendance rates for youth and young adults are relatively low compared to older adults, then certain factors may be more important in pulling or pushing Indigenous Australians away from education. Finally, when a person studies may have a strong influence on the likely benefits and costs, as well as the overall success their education. On the one hand, the older a person is, the higher the likely costs of education in terms of income foregone and, especially when combined with a lower life expectancy, the less time a person may have to enjoy the benefits of education. On the other hand, by undertaking post-secondary studies as a more mature student, individuals may have better study habits and be more discerning in their choice of subjects and courses. Information on when the Indigenous population choose to undertake education is therefore important in understanding the potential benefits of education.

There has been some research looking at the age of Indigenous students. Encel (2000) reported that, using administrative data from the then Department of Education Training and Youth Affairs (DETYA), Indigenous university students tend to be around five years older than their non-Indigenous counterparts. This was true for undergraduate and postgraduate students. Similarly Gray, Hunter and Schwab (2000) found, using a cohort analysis of the 1986, 1991 and 1996 Censuses, that non-Indigenous youth had a higher participation rate than Indigenous youth, whereas there were higher participation rates for Indigenous Australians later in their life.

The following table presents results for the latest available Census. It gives the median age of both university and TAFE students. The table also gives the median age of non-students aged 15 years or over to compare the results against. The table is broken down first by sex, then by a number of other factors.

Table 2.6 Median age by educational institution and Indigenous status for non-high school students

	Indigenous			Non-Indigenous		
	University	TAFE	Non-student	University	TAFE	Non-student
Male	29	25	32	23	23	43
Female	29	28	33	23	29	44
Employed	30	27	33	25	26	40
Unemployed	25	25	28	21	25	33
Not in the labour force	27	28	33	22	27	60
Full-time student	25	26	n.a.	21	21	n.a.
Part-time student	33	28	n.a.	32	30	n.a.
Total population	29	27	32	23	26	44

Source: Customised data from the 2001 Census

Note: Those who didn't respond to individual questions (not including Indigenous status and educational attainment) are only excluded for that particular breakdown.

Looking at the last row of the table, which gives data for the whole applicable population, we can see that the median Indigenous university student is about six years older than their non-Indigenous counterpart.[8] This is despite the fact that non-Indigenous Australians are a much older population (as shown in Section 2.1.1). Interestingly though, TAFE students are of roughly the same age for Indigenous and non-Indigenous students (and therefore younger than university students in the Indigenous population, but older for the non-Indigenous population).

Looking at the breakdown of males and females, for the Indigenous and non-Indigenous populations, the median male university student is roughly the same age as his female counterpart. Male TAFE students, however, are younger than female TAFE students – by 3 years for the Indigenous population and 6 years for the non-Indigenous population.

Within the labour force status breakdown, the pattern for non-students is not surprising. Unemployment is more prevalent amongst the younger population, whereas those not in the labour force are slightly older than those who are employed. Amongst university students, however, there is a slight variation. Broadly speaking, those who are more likely to be supporting themselves (those employed) are older than those who are more likely to be being supported (those unemployed or not in the labour force).

Moving on to the full-time/part-time student breakdown, it is not surprising that part-time students are older than full-time students. This is probably because the relative costs of studying (especially the income foregone) is higher for older persons, as are the familial and other responsibilities. That is, older students are likely to have less time available (after work and other responsibilities) to devote to their studies. Interestingly, the gap between part-time and full-time students is much higher for the non-Indigenous rather than Indigenous populations (11 years as opposed to eight years for the respective university student populations and nine and two years for TAFE students). Indeed, for university students, those studying part-time are of roughly the same age across

[8] Note high school students are not represented anywhere in the table. The average age for this type of student is similar for both the Indigenous and non-Indigenous population with figures available from the author upon request.

Indigenous and non-Indigenous students. This is an important result, as it shows the difference in average age between Indigenous and non-Indigenous university students is driven mainly by the much younger full-time student population amongst non-Indigenous Australians.

Table 2.6 showed how the average age of students varied. To design policy to take into account the different needs of young and old students, it is equally important to know how a number of social, economic and health characteristics varied across different types of students. This is shown below in Table 2.7 where four types of individuals are analysed. Excluding high school students, those who are studying at post-school institutions are broken down into those aged 15 to 29 years and those 30 years and over. A similar breakdown is done for those not studying. Within each of these age/student status combinations, the proportion that has a given characteristic is given. These characteristics are roughly categorised into three groups: characteristics expected to impact on human capital and readiness to learn; characteristics related to access to education; and characteristics expected to impact on time constraints.

As these results come from the 2002 NATSISS as opposed to the Census, it is important to make sure any differences are statistically significant and unlikely to be caused by sampling error alone (for a discussion on sampling error as it applies to the 2002 NATSISS, see Biddle and Hunter 2006c). For this reason, those variables marked in **bold** are those for which the difference between column 1 and column 2 is significant at the 5% level of significance.

Table 2.7 Characteristics of students by age

	Student at post-school institution		Not a student	
	Aged 15 to 29	Aged 30 and over	Aged 15 to 29	Aged 30 and over
Finished Year 12	**43.7**	**23.2**	23.0	11.7
English main language spoken at home	93.8	92.1	83.2	85.4
Used a computer in last 12 months	82.7	85.4	58.9	42.6
Used the Internet in last 12 months	70.7	66.7	42.2	28.7
Lives in a remote area	13.7	16.7	31.6	28.2
Has a disability or long-term health condition	**22.0**	**39.6**	24.0	23.9
Equivalised household income in bottom quintile	36.2	31.8	44.2	42.9
Has perceived transport difficulty	28.9	26.4	33.4	27.7
Is main carer for someone aged 12 or less	**19.9**	**39.2**	33.8	31.3
Used child care in last 4 weeks (for those who are main carer)	78.3	73.1	0.73	60.0
Participated in sport in last 12 months	**68.8**	**54.5**	56.2	37.6
Has high-risk alcohol consumption	2.1	2.9	15.1	7.4
Employed	56.3	61.0	46.5	47.0
Arrested in last 5 years	**18.5**	**6.9**	25.7	13.3

Source: Customised table from the 2002 NATSISS

Note: The variables marked in **bold** are those for which the difference between students aged 15 to 29 and those aged 30 and over is significant at the 5% level of significance.

Table 2.7 shows that there are a number of variables for which those students aged 15 to 29 years are significantly different to those students aged 30 years and over. Older students are much less likely to have finished Year 12 than their younger counterparts and therefore likely to begin their studies with lower literacy and numeracy skills. Also, older students are more likely to have a disability or a long-term condition and therefore face physical difficulties in attendance at school.

Younger students are less likely to be the main carer for someone aged 12 years or under and more likely to have participated in sport in the last 12 months. These differences may lead to different demands for student services at their post-school institution. Finally, young students are more likely to have been arrested in the last 5 years. Provision of legal services at their university or TAFE college is therefore more likely to be of benefit to these students than those aged 30 years or over.

Just as interesting as the variables where there are significant differences are some of the variables where the proportions for the older and younger student populations are not significantly different. Encouragingly, there is no significant difference in the use of either computers or the Internet between older and younger students.

Chapter 3 Developing a human capital model for Indigenous education

The relatively low educational participation rates of Indigenous Australians presented in the previous chapter have been recognised for a long time. The factors associated with this low participation have been examined by a number of researchers; however, the explanations have varied. At different times, authors have focussed on curriculum and school-related factors, including resistance to perceived racism (for example Purdie et al. 2000), household and socio-economic factors (Hunter and Schwab 1998), physical and emotional health (Zubrick et.al 2006) and remoteness and the related economic incentives (Johns 2006). The labour market circumstances of Indigenous Australians have also been documented, including the relationship between a person's education levels and their probability of being employed (Hunter 2004) or their wages once employed (Daly 1995).

Despite this relatively large amount of research on education and labour market outcomes, there have been fewer attempts to develop a theoretical model that links the two. Hunter (2004) discussed a labour supply/labour demand model; however, the education decision was treated to a certain extent as exogenous. In this chapter, a theoretical model is developed that attempts to treat education as an endogenous decision. That is, Indigenous youth are assumed to make the decision about whether or not to go to school based on the benefits and costs of doing so. While the HCM is used as a basis and research from other contexts is included to incorporate, amongst other things, the social costs and benefits of education, this is the first time such a model has been developed for the Indigenous Australian population.

The model developed in this chapter is used to inform and motivate the empirical results that are found throughout Chapters 5 to 8 and the policy implications from these results. As it would not be possible to estimate all the parameters of the model, the development of the model is ultimately motivated by the need to give some structure to the empirical analysis in the remainder of the thesis.

Section 3.1 introduces some of the concepts from the HCM whereas Section 3.2 outlines the basic extensions to the model. Section 3.3 looks in more detail at cognitive and non-cognitive ability and how it impacts on participation, as well as why it might vary across population subgroups. In Section 3.4 the possibility that there are unobserved costs of education that impact on participation and measured outcomes is discussed whereas in Section 3.5 other possible extensions to the model, including uncertainty and other investments related to education like health and migration are outlined. Finally, Section 3.6 discusses the implications of the model and how it is used to inform the remainder of the empirical analysis in the thesis.

3.1 Introducing the human capital model (HCM)

The HCM in more or less its current form was outlined by Becker (1964) who was one of the first economists to formally model the decision to invest in education as a function of person's future income stream. At the heart of the model is the assumption that when deciding whether or not to undertake a certain type of education, potential students are rational (in the economic sense) utility maximisers who, above all, see education as an investment. An investment in education will improve one's performance in the workplace and an individual will invest until the returns to an additional unit of education (measured by increases in discounted future income) just equal the cost. That is, until marginal returns equal marginal cost.

Although the HCM has been quite influential in education research and policy making, it has also been recognised that, at least under the basic specification presented above, it has a number of limitations. The first of these is whether education enhances productivity directly (as assumed in the HCM) or instead acts as a signalling or screening device whereby already productive workers are identified (first developed in Arrow 1973 and Spence 1973).

Under the alternative specification, employers assume that those with higher innate ability find education easier (or less costly) and are therefore more likely to invest heavily in education than those who find education a struggle. The employer is therefore more likely to hire the educated person not because the education they have undergone has made them more productive, but because it has demonstrated that they were more productive in the first place.[9]

Whether or not it is human capital or screening/signalling which is driving the differences in earnings has important implications for some aspects of policy development. If governments are trying to decide on the level of investment they make in education or the type of education to focus on, then under the HCM, across-the-board increases in education lead to higher economy-wide productivity and therefore there is a much stronger argument for government provision of education. Under a signalling/screening model, however, education only affects relative earnings and therefore economy wide increases in education have no or little effect on economic growth.

It is reasonable to assume that individuals are concerned less with whether undertaking education leads to higher income because it signifies pre-existing ability or because it improves their skills, but rather whether the benefits of education that they might expect for themselves outweigh the costs. When focussing on participation in education, therefore, the more important issue is whether there is variation in the returns to education across the population. Hence, the model outlined in this chapter uses aspects from both the HCM and signalling/screening hypotheses.

There are a number of limitations of the basic HCM and the signalling/screening hypotheses that, if taken into account, may help to explain education behaviour. Some that are proposed for the Indigenous population in this chapter are outlined below.

- Utility whilst at school: The basic HCM assumes that a person's utility is determined by their income, and if discounted future additional income is higher

[9] An alternative explanation is the 'job competition' model (Thurow 1976) where individuals are allocated to jobs based on their education (amongst other things) because it allows employers to estimate the costs of providing on the job training. This model has been used as an explanation for situations of over-education where a large number of people are observed to have higher formal levels of education than are required for their current job (Sicherman 1991).

than the cost of education, then people will invest in education. It is likely, though, that a student's current social situation is also important in influencing their behaviour.

- Non-economic returns: There are a number of other outcomes that are likely to be associated with higher education levels that people may take into account when deciding whether or not to invest in education. Although there are indirect effects that operate via income, education may also have direct effects on things like health, the schooling of one's children, the efficiency of consumer choices and the ability to plan fertility decisions (Wolfe and Haveman 2001).
- Uncertainty about returns: The HCM assumes that potential students make their decision based on a comparison between their future income streams with and without education. Potential students cannot know their future income for sure, however, and must therefore form expectations based on what they do know. Different students have access to different information than others so it is possible that expectations are also formed differently (Dominitz and Manski 1996).

In the following section a model of behaviour and outcomes is set up that takes into account some of these limitations, focussing on the Indigenous population.

3.2 A human capital model for Indigenous Australians

Having introduced the HCM in the previous section and discussed a few of the limitations, this section outlines a modified model that focuses on the Indigenous Australian population. To keep the analysis tractable, a number of simplifying assumptions about behaviour and outcomes are made. Firstly, it is assumed that there are only two levels of education that people are deciding between: completing high school and not completing high school. The model could, however, be quite easily extended to take into account continuous years of schooling or post-school qualifications. This is done to a certain extent in later parts of this chapter, as well as in the empirical analysis in the remainder of the thesis.

The second simplifying assumption is that the model does not explicitly take into account how well a person does at school in terms of grades. That is, all those who complete high school are assumed to have the same level of education as each other, whereas those who do not complete high school also have an equal but lower level of education. Some of the parameters can be interpreted to include school performance; however, grades or effort at school are not modelled explicitly.

Finally, all the costs and benefits of education are expressed in terms of income. That does not mean that individuals in the model do not take other things into account when making their decisions, but rather that the things people do take into account can be expressed as the level of income that those other costs and benefits are equivalent to. Other benefits that are expressed in terms of income include the benefits of employment, the health benefits of education and the social stigma that some students may face whilst at school.

3.2.1 Setting up the basic model

The presentation of the model begins with a simple specification where a person's discounted lifetime income once they have finished their studies is higher for those who complete high school $(H_i = 1)$ compared to those that do not $(H_i = 0)$. This increase in income is through the productivity effect of education on earnings. In addition, lifetime income is assumed to be higher for those with higher ability, represented by A_i. Here, cognitive and non-cognitive ability refers to a person's intelligence and personality traits respectively that, importantly, are not affected by the type of education under question. There may, however, be variation in ability across the population through genetic influences, family background and earlier schooling. Finally, following Tobias (2003) and Carneiro and Heckman (2003), the benefits of education are higher for those with higher ability.

Assuming a linear function, discounted lifetime income is therefore given as follows:

$$Y_i = \beta_0 + \beta_1 H_i + \beta_2 A_i + \beta_3 H_i A_i \tag{1}$$

In this equation, β_0 represents the level of income that the person with the lowest level of ability would receive and β_1 represents the increase in discounted lifetime income (Y_i) from high school for the total population. Next, β_2 represents the effect that ability has on income for both those who do and do not complete high school and β_3 the increasing returns to ability for those who complete high school. It is assumed in the model that β_1, β_2 and β_3 are all positive.

Under this specification, everyone would see high school as being worthwhile. However, a further assumption is that there is an observed cost of education (β_4) which does not vary by ability. This cost could reflect the opportunity cost of education (income foregone whilst studying) or the direct upfront costs from things like fees and materials. This leads to a discounted lifetime income net of the cost of education as follows:

$$Y_i^N = \beta_0 + \beta_1 H_i + \beta_2 A_i + \beta_3 H_i A_i - \beta_4 H_i \tag{2}$$

Individuals will choose to undertake high school if their net discounted lifetime income under the completing high school scenario is greater than the net discounted lifetime income if they do not complete high school (in economic terminology when the marginal cost equals the marginal benefit). That is, solving $Y_i^N\left(H_i = 1\right) > Y_i^N\left(H_i = 0\right)$, an individual will undertake education if:

$$\begin{aligned} &\beta_0 + \beta_1 + \beta_2 A_i + \beta_3 A_i - \beta_4 > \beta_0 + \beta_2 A_i \\ &or \\ &A_i > \frac{\beta_4 - \beta_1}{\beta_3} \end{aligned} \tag{3}$$

That is, education is concentrated amongst those in the population with the highest ability. This implication of the model has been supported empirically in datasets which have wages, schooling and measures of ability (Cawley, Heckman and Vytlacil 2001) and has important implications for the analysis in this thesis.[10]

Letting ability be distributed uniformly $\left(A \sim U\left(0, A^*\right)\right)$ across the population,[11] and setting $A_1 = \dfrac{\beta_4 - \beta_1}{\beta_3}$, the proportion of the total population who will choose to attend high school will be:

$$
\begin{aligned}
P_1 &= 1 - \int_0^{A_1} f\left(A\right) dA \\
&= 1 - \frac{A_1}{A^*} \\
&= 1 - \frac{\beta_4 - \beta_1}{A^* \beta_3}
\end{aligned}
\tag{4}
$$

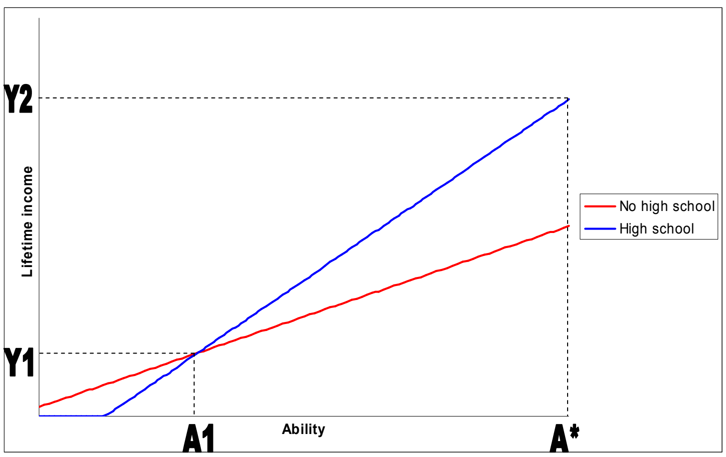
The income of the person indifferent between completing high school and not completing high school is $Y_1 = \beta_0 + \dfrac{\beta_2\left(\beta_4 - \beta_1\right)}{\beta_3}$ and the income of the person in the population with the highest ability is $Y_2 = \beta_0 + \beta_1 - \beta_4 + A^*\left(\beta_2 + \beta_3\right)$.

[10] The model implies that if $\beta_4 < \beta_1$ then everyone will want to be educated. This is a similar implication to the standard human capital model where people will invest until the cost equals the benefit. However, it may not hold in practice as the model does not consider the supply of education (for example the provision of classrooms and teachers). Unless there is a perfectly elastic supply, then it is likely that a large shift in demand for education would lead to a movement along the supply curve and an increase in the price. At the national level most of this increase in price is likely to be absorbed by the government and the Indigenous population does not make up a large enough proportion of the total population to have a significant effect on overall demand. However, this may not be the case for certain parts of Australia where Indigenous Australians are highly concentrated. Under these circumstances, an increase in the demand for education from β_4 moving closer to or below β_1 might have an effect on price. It might lead to increases in the price for the government through, for example, having to bring in a number of additional teachers or for the individual through classroom overcrowding and having to travel further to attend school.

[11] The model holds if ability is distributed normally; however, a uniform distribution is assumed to enable a simpler graphical presentation.

This simplified model can be represented by the following diagram which plots the population ranked by ability on the x-axis against lifetime income on the y-axis. The fainter line represents the gross discounted lifetime income that each person along the ability scale would receive if they do not complete high school and the darker blue line gross discounted lifetime income if they did.

Figure 3.1 Net lifetime income by ability



Average net discounted lifetime income for those who do not complete high school is:

$$\bar{Y}_1\left(H_i = 0, A_i < A_1\right) = \int_0^{A_1} \left(\beta_0 + \beta_2 A\right) f\left(A\right) dA$$

$$= \left[\frac{\beta_0 A}{A_1} + \frac{\beta_2 A^2}{2A_1}\right]_0^{A_1} \tag{5}$$

$$= \frac{\left(\beta_0 + Y_1\right)}{2}$$

For those who do complete high school, net income is as follows:

$$
\begin{aligned}
\overline{Y}_2\left(H_i=1, A_i>A_1\right) &= \int_{A_1}^{A^*}\left(\beta_0+\beta_1-\beta_4+\left(\beta_2+\beta_3\right)A\right)f\left(A\right)dA \\
&= \left[\frac{\left(\beta_0+\beta_1-\beta_4\right)A}{A^*-A_1}+\frac{\left(\beta_2+\beta_3\right)A^2}{2\left(A^*-A_1\right)}\right]_{A_1}^{A^*} \\
&= \left(\beta_0+\beta_1-\beta_4\right)+\frac{\left(\beta_2+\beta_3\right)\left(A^*+A_1\right)}{2} \\
&= \frac{\left(Y_1+Y_2\right)}{2}
\end{aligned}
\qquad (6)
$$

Letting the average benefit of high school as measured by a researcher (who does not observe ability) be the difference between the two average net discounted lifetime incomes across the population, this gives:

$$
\begin{aligned}
B_1 &= \overline{Y}_2\left(...\right)-\overline{Y}_1\left(...\right) \\
&= \frac{\left(Y_1+Y_2\right)}{2}-\frac{\left(\beta_0+Y_1\right)}{2} \\
&= \frac{Y_2-\beta_0}{2}
\end{aligned}
\qquad (7)
$$

This average benefit of education overstates what the potential benefit of education would be for each individual across the distribution of ability. This is because high school completion is concentrated amongst those who have a higher ability and hence greater earnings potential in the first place. That is, those who do complete high school would have a higher income on average even if they chose not to. This is known in the literature as ‘ability bias’ (Belzil and Hansen 2002).

An alternative measure of the benefit of education that does not suffer from such biases might focus on those who do see education as being worthwhile (those to the right of A_1). That is, by calculating the difference between their average income with and without education, one is able to measure the average productivity benefits of education that result from β_1 and β_3.

The difficulty in calculating a measure of the benefits of education that controls for ability bias is that a researcher is unlikely to have information on what the income would be for those individuals who do complete education $\left(A_1 \leq A \leq A^*\right)$ under the alternative assumption that they did not. To estimate such benefits, researchers often attempt to exploit natural experiments where one group of people has an external impediment to undertaking education that another group of people who are assumed to have the same distribution of ability do not (Cunha et al. 2006). Unfortunately, there are no readily available such natural experiments for the Indigenous population, a point which is taken up in the concluding chapter of this thesis. The ability bias discussed here does nonetheless have a number of important implications for a number of the predictions that stem from later modifications to the model.

The parameters in Equation (2) will have a strong influence on the two main outcomes of interest: the proportion of the population who participate in education; and the relative income of the two groups. The remainder of Section 3.2 therefore looks in more detail at the parameters of the model including how they are predicted to influence the two main outcomes as well as why the parameters might vary across populations.

3.2.2 The base level of income $\left(\beta_0\right)$

The base level of income that everyone is assumed to receive regardless of education or ability $\left(\beta_0\right)$ is likely to be made up of sources from outside the labour market, particularly income support from the government. This base income is not expected to have any effect on the proportion of the population who undertake education, nor on the predicted benefit of education. This is because the model focuses on absolute differences in income as opposed to ratios or percentage differences. However, under a different measure of the predicted benefit of education that expresses the increased income relative to what income would be without completing high school, the base level of income does have an effect.

3.2.3 The effect of education on income (β_1)

The increase in net lifetime income from education that is not affected by ability (β_1) is expected in the model to increase the proportion of the population for whom education is worthwhile (P_1), as well as the predicted benefit of education. This increase in net income is likely to be affected by the value the labour market puts on the type of education that a person receives. This is in turn affected by the quality of the education that a person receives and the labour market to which the person supplies their labour.

If the Indigenous population receives an education that is not valued as much in the labour market as the education that the non-Indigenous population receives, then β_1 may be relatively low. This could include the grades with which the Indigenous population finishes Year 12. If they are lower on average than for the non-Indigenous population, then β_1 might also be lower. Alternatively, the quality of education that Indigenous Australians receive might differ from the non-Indigenous population. While private schools should not necessarily be assumed to provide a better education than public schools, the fact that 14.0% of Indigenous school students are attending non-government schools compared to 32.9% of non-Indigenous students[12] shows the potential for quite large disparities in the resources devoted to the respective populations throughout their school career (Ryan and Watson 2004 document the lower staff to student ratios in private schools). This issue is discussed in Chapter 8.

Given the quite different geographies that Indigenous and non-Indigenous Australians live in (as shown in Section 2.1.2), the labour markets that they participate in might also be different. Even in the same geographical area, through cultural preferences or discrimination, Indigenous Australians might work in quite different industries to the non-Indigenous population (above and beyond any differences caused by their skills mix). Furthermore, the CDEP scheme (outlined in Section 2.2.2) is an Indigenous-

[12] Both figures come from customised calculations using the 2001 Census. Of the 14% of Indigenous students attending non-government schools, 9.3% are attending Catholic schools and 4.7% other non-government schools. For the non-Indigenous population, the figures are 20.6% and 12.2% respectively.

specific employment program that has a quite different labour demand profile to other employment types.

Assuming, therefore, that Indigenous Australians participate at least to a certain extent in different labour markets to the non-Indigenous populations, differences in the supply of and demand for their labour may lead to differences in the relative wage gap between a high school completer and someone who doesn't complete high school. For example, given the current supply of Indigenous Australians who have completed high school is relatively low, those who have completed high school may be able to command relatively large wage premiums. On the other hand, the demand for skilled labour in the areas where Indigenous Australians live might not be that strong and hence (in addition to having extra pressure to migrate) the value of β_1 may in fact be lower for the Indigenous population.

3.2.4 The cost of education (β_4)

The extent to which β_1 influences outcomes is determined by the difference between it and the cost of education. The cost of education (β_4) obviously has a strong effect on whether or not people see education as being worthwhile and, for those that do see it as being worthwhile, the economic benefit of undertaking education. There are a number of factors that make up the cost of education, beginning with the direct costs like fees and materials. In Australia, the upfront costs of high school education are small. That is, there are generally places available in a public school for everyone who wishes to attend. However, there are upfront cost of attending certain types of secondary schools (private and Catholic schools), as well as in obtaining post-school qualifications.

Perhaps the biggest cost of education in Australia is the income foregone whilst studying. That is, a 15, 16 or 17-year-old who is not currently studying has the potential to earn a much higher income than those who are. One of the main ways the government reduces the cost of education is through income support for late secondary as well as tertiary education students. For the non-Indigenous population, income support is paid through Youth Allowance for those aged 16 to 24 years and Austudy for those aged 25 years and over.[13] Receipt of this income support is conditional on a parental income and assets test, and the fortnightly amount decreases as the individual's own income increases.

The Indigenous population receives their income support through a similar program called Abstudy. Unlike the non-Indigenous population, those aged 15 years in tertiary study are paid a small allowance of $25.20 per fortnight. For those aged 16 to 20 years, the living allowance received through Abstudy for those living at home is the same as the living allowance for those paid through Youth Allowance. For those aged 21 years or over, however, the level of support that an Indigenous person receives is higher than a non-Indigenous person (Centrelink 2006a, 2006b).[14]

Under Abstudy, Indigenous students also receive a number of other allowances for things like fees, incidentals, fares and thesis submission. Clearly these extra payments for Indigenous students are designed to ameliorate some of the direct and indirect costs of education. Combined with the fact that the Indigenous population has, on average, lower family income and hence are more likely to be below the parental income and assets tests limits, the income support available from the government is likely to be higher than for the non-Indigenous population.[15] This does not, however, necessarily mean that the costs of education are lower for the Indigenous population as outlined below.

The other component of the income foregone whilst studying is the income that could potentially be earned if that person was able to work full-time. The higher the potential income, the higher the opportunity cost of studying. Through time, this would imply that as youth unemployment rose, all else being equal, attendance at school would increase (Lamb et al. 2004). It would also imply that those population subgroups that face high

[13] Youth Allowance is also paid to New Apprentices in the same age range, as well as the unemployed aged under 21 years.
[14] The exception to this is if a non-Indigenous person has children. They receive the same level of support as an Indigenous Australian with children.
[15] The actual income received, however, may not always reflect this as the administrative costs of applying for income support may impact more heavily on the Indigenous population.

unemployment or low income if they are not studying would have higher attendance at education.

The costs of education to the student are likely to vary across households. As banks are unlikely to lend to high school students based on their future earnings capacity, all else being equal, consumption levels are likely to be lower for those at high school compared to those working full-time. That is, high school students face liquidity constraints on their ability to smooth their consumption. If a close family member has a good indication that the student will be able to complete high school and therefore have higher earnings into the future, or if they derive some utility themselves from that individual completing high school, then they may be more inclined to lend the student money or partly subsidise the education than a financial institution would (Cox 1990). This may be either in-kind (through food and shelter) or directly (e.g. as 'pocket money'). As those parents and households with higher income are able to provide higher levels of transfers, the opportunity cost of education to a student in a high income household is likely to be lower than for those in low income households.

Students are able to mitigate some of the opportunity costs of education by undertaking a part-time job. There is, however, evidence that a large proportion of students find their part-time job through the contacts of a family member (Smith and Wilson 2002) and hence those individuals whose parents are less likely to be employed may be less able to find a part-time job themselves. Biddle (2006a) found that late secondary school students in households with no-one employed were less likely to work part-time than those households where at least one person was employed. However, Biddle (2006a) also showed that even after controlling for family and household characteristics (including income), Indigenous high school students are significantly less likely to be working in a part-time job. Given that part-time work is how many students reduce the costs of education, if this lower probability is because they find it harder to obtain employment, then this may raise the costs of education.

The non-income costs of education are discussed in Section 3.4.

3.2.5 The income benefit of ability (β_2) and (β_3)

The income benefit of ability for the population as a whole (β_2) and the additional benefit for those who complete high school (β_3) also have an effect on the outcomes of interest. The proportion of the population who undertake education is positively influenced by β_3 but is not influenced by β_2. The predicted benefit of education (B_2) is, however, positively affected by both β_2 and β_3. While the influence of the latter variable is not surprising, that a higher β_2 leads to a higher predicted benefit is caused by education being concentrated amongst the highest ability population. In a sense, the variable β_2 is the main reason for the ability bias mentioned earlier.

Cawley, Heckman and Vytlacil (2001) found evidence that in the USA there are differences in the relationship between ability and wages for black males and females, Hispanic males and females and white males and females. These differences remained after controlling for schooling (which also had a different effect) and region of residence. It may also be the case that in Australia there are differences in β_2 and β_3 between the Indigenous and non-Indigenous populations. This may be through discrimination (Hunter 2004) or the type of labour markets that Indigenous and non-Indigenous Australians have access to (where the costs of migration outlined in Section 3.5.4 mean that people aren't always able to move to take advantage of better labour markets). The central role of ability in the model is discussed in the next section.

3.3 The role of ability in the model

One of the major components of the model is a person's ability. In the model, without variation in ability, either everyone would see education as being worthwhile, or no-one would. In the model presented in Section 3.2 where a uniform distribution is assumed, a population with a lower level of ability can be represented by a lower A^*. A lower average level of ability will lead to fewer people seeing education as being worthwhile (from Equation (4)), a lower average income for the population that does undertake education (from Equation (6)) and a lower predicted benefit of education (from Equation (7)).

This section looks at why a person's ability may have such a strong effect on education participation and the outcomes of education, as well as why Indigenous Australians might have different patterns of cognitive and non-cognitive ability.

3.3.1 The components – Cognitive and non-cognitive ability

There are two components of ability that are assumed to influence outcomes: cognitive and non-cognitive ability. Cognitive ability refers to a person's intelligence or scholastic aptitude and is traditionally measured by things like IQ tests. Non-cognitive ability refers to things like self-discipline, motivation and time preference that are not traditionally measured by IQ tests but nonetheless have been found to influence academic achievement (Duckworth and Seligman 2005). Furthermore, non-cognitive ability has effects on academic achievement and future economic prospects even after controlling for the effect of cognitive ability (Heckman and Masterov 2005).[16]

The way in which ability enters the model is the influence it has on a person's employability and wages above and beyond the relationship that education has with these outcomes. This is captured in the model by β_2. In the Marxist economics literature (Edwards 1976, p.65), the behavioural traits that are rewarded by the firm are to be a 'docile, inert, [but] productive input into the production process.' While this may have some validity in relatively low skilled jobs, other components of ability like the capacity to learn new skills, confidence and personal motivation are likely to be more important in relatively high skilled jobs.

[16] This distinction between cognitive and non-cognitive ability and their individual components is related to the theory of "Multiple Intelligences" which posits 'seven relatively independent forms of information processing' (Gardner and Hatch 1989, p.4). While the delineation differs, the underlying concept that there are a variety of abilities that are valued both in formal education and in the labour market remains the same.

Ability in the context of this thesis means the cognitive and non-cognitive skills that a person possesses at the time at which they are making the education decision. This is an important distinction because while it excludes the skills development from the particular education being considered, it does include the cumulative effect of early schooling, family environment and peer interactions. That is, both nature and nurture are important. This implies that skills development is self-productive (Cunha et al. 2006) or that the level of skills a person has at a given point in time increases the gains from learning new skills through education. This is captured in the model by β_3.

Skills development is also complementary. That is, previous skills development makes the investment in later skills development easier (Cunha et al. 2006). An alternative explanation of β_3 is, therefore, that it captures the lower cost of education for those with higher ability (Blackburn and Neumark 1993). Those with higher ability may have lower costs of education because they are able to fulfil the requirements of the education in less time (thereby leaving them a greater number of hours to work) or with less expenditure on things like extra tuition.

3.3.2 Variation in cognitive and non-cognitive ability between the Indigenous and non-Indigenous populations

Inherent ability is unlikely to vary across population subgroups. Although there is no specific evidence that the Australian Indigenous population is not any more or less 'intelligent' than the non-Indigenous population, that no evidence has been found for other population subgroups (Nisbett 1998; Fryer and Levitt 2006) would suggest that this is unlikely to be the case.[17] Rather, any differences between population subgroups in measured ability by the time they reach the age at which they make decisions regarding

[17] In their introduction, Jencks and Phillips (1998) outline three reasons why they think there are no hereditary reasons for the observation that blacks in America score relatively poorly on standard aptitude and IQ tests. That is: when a person's African-American ancestry is not visible there are no differences in young children's test scores; there are no differences in early test scores between a black and a white child who grow up in a European-American family; however when black Americans raised in white families reach adolescence, they begin to fall behind in their test scores.

continuing education is likely to be caused by an accumulation of constraints on their learning until that point in time (Fryer and Levitt 2004).

That Indigenous Australians have lower ability levels in a model such as this does not mean that they are somehow less able in absolute terms than the non-Indigenous population. Rather, it simply means that the skill and ability mix that they do possess is valued less in formal education and the labour market. This is illustrated by a consideration of one of the main components of ability, English literacy skills.

In the Australian labour market, the ability to communicate effectively in written and spoken English leads to both a higher probability of being able to obtain employment, and once employed, a higher wage or salary. Furthermore, there is also evidence that the effect of education (and experience) on earnings is higher for those who speak English than those who do not (Chiswick and Miller 1995). Indigenous students have been found to have lower levels of English reading ability than non-Indigenous students (De Bortoli and Cresswell 2004).

If one allows for the concept of 'multiple literacies' then, from a public policy perspective, the differences in English language skills between Indigenous and non-Indigenous Australians become less of an issue of deficiencies, and more a problem of how to incorporate diversity. The concept of 'multiple literacies' refers to the idea that there is not one way to communicate in English that is correct in exclusion to all other forms of communication (Gee 1991). Rather, there are a range of uses of the English language and people employ different words and forms of communicating depending on who they are interacting with. For example, a medical doctor will communicate in quite different ways to a colleague compared to a patient, even if it is in order to convey essentially the same information. Indigenous Australians are likely to have mastery over a different set of literacies to the non-Indigenous population; however, within each of the populations there is likely to be more variation still (Kral and Schwab 2003).

While there may be an infinite range of literacies and forms of communication, only a subset of these are valued in formal education, especially when the time comes for external examinations. The skilled section of the labour market or those industries that engage with the rest of the economy are also likely to place more value on the language and communication skills that non-Indigenous Australians are more comfortable with. Furthermore, if interaction with the government is restricted to a subset of communication styles, then those who find it difficult to engage in such styles may also find it difficult to access the government resources and assistance that they are otherwise entitled to.

To engage with these sectors, Indigenous Australians must therefore have mastery of the subset of literacies that are relatively more highly valued. An argument could be made that the labour market and education system especially should be more accommodating towards the language skills (and learning styles) that Indigenous Australians already possess (Schwab 1999). However, from the point of view of the analysis in this thesis, the model assumes that when making the decision of whether or not to complete high school, individual Indigenous Australians must take the situation as given.

Another factor that may impacts on a person's ability level might be truancy or non-attendance at earlier stages of schooling. Those students who have irregular attendance during the early years of schooling (with or without permission from their parents) are less likely to develop the skills and knowledge that enable them to successfully complete later years of schooling. Indigenous students have been found to have higher rates of non-attendance at school (Bourke, Rigby and Burden 2000), even after controlling for family background characteristics (Rothman 2001).[18] Even when at school, Indigenous students may be perceived in a different way by their teachers and hence taught differently. If teachers of Indigenous students assume that they will have lower levels of ability than non-Indigenous students, then these lower expectations may lead to lower expectations

[18] Rather than being a cause of lower ability amongst Indigenous students, truancy could also reflect a disengagement from school that is caused by lower perceived ability or expectations.

and hence effort from the students themselves (Ferguson 1998 made a similar argument regarding minority students in the USA).

Another reason why Indigenous Australians may have relatively low cognitive and non-cognitive ability by the time they reach late secondary school is their experiences in early schooling. For example, preschool education can have benefits across a number of social outcomes. Partly because of the effect on later academic achievement, but also because of direct effects on social skills, maturity and self-confidence (Kronemann 1998), children who attend preschool have been found to be better off in terms of self-esteem and later social and emotional maturity, as well as being less likely to engage in criminal and antisocial behaviour, teen pregnancy or drug abuse (Hull and Edsall 2001). Heckman, Stixrud and Urzua (2006) identify early childhood education as having its greatest effect on non-cognitive ability (motivation, persistence and self-esteem) as opposed to cognitive ability.

The potential positive effects that preschool education might have on future academic achievement and broader cognitive development are also important. Preschool, if of sufficient quality, can improve a child's school readiness and close some of the gap between 'at-risk' and other students in terms of cognitive development and school achievement.

Most studies find that in the short term, there are large effects on both achievement and IQ scores (Boocock 1995; and for a summary, see Barnett 1995). There is, however, less agreement about whether these effects last into the long term. In a meta-analysis of 36 and 38 studies looking at the effect of early childhood education on children in poverty (in the USA), Barnett (1995 and 1998 respectively) did indeed find that early gains in IQ scores faded reasonably quickly. In terms of 'achievement effects' and effects on school success, however, Barnett (1995 and 1998) found lasting and substantial effects on achievement in both experimental and quasi-experimental studies.

The positive effects of quality preschool education are concentrated amongst the most disadvantaged children as measured by family background characteristics (Caughy, DiPietro and Strobino 1994). This may be because the low-income families of these children lack the means or ability to support their child's cognitive development and socialisation (Barnett 1995). The relative socio-economic status of the families in which Indigenous Australians grow up may therefore have additional effects on later ability and academic achievement. For example, in the USA, the presence of reading materials in the home has been found to explain 'a substantial proportion' of the difference in cognitive development between children from low and high income families (Brooks-Gunn and Duncan 1997).

These effects of family background on cognitive development and schooling have also been found amongst older students (Phillips et al. 1998).[19] This may be through more highly educated parents being better able to directly support their children's learning, higher-income parents being better able to afford the things that improve childhood learning or the attitudes of parents towards schooling affecting the attitude of their children.

3.4 Unobserved costs of or barriers to education

Until now, the model has assumed that the costs to education are measurable and observed by the researcher. The most common observed costs of education used in the HCM are the income foregone whilst studying, however if one is considering post-school qualifications, it may also include the upfront costs involved with vocational and university education. This section considers a modification to the model where one part of the population has an additional cost of education to the rest of the population that is unobserved by the researcher and is not related to ability $\left(\beta_5\right)$. These costs of education

[19] Phillips et al. (1998) outline how genetic factors may appear in family level correlations if: a) a parent's genes affect the environment they provide for their children (passive correlation); b) children's genes cause them to seek out particular environments (active correlation; and c) the environment reacts differently individuals with different genes.

could represent the financial or personal effort some in the population need to expend in order to overcome barriers to education that are felt by a sub-section of the population.

This extension to the model is based on discussion in Hollenbeck and Kimmel (2001) who looked at differences in measured returns to education for those with and without a disability (in the USA). In addition to disability, other potential unobserved costs of or barriers to education for the Indigenous population are considered.

3.4.1 Setting up the model

Net income for the population that faces the unobserved cost of education is as follows:

$$Y_i^{N,C} = \beta_0 + \beta_1 H_i + \beta_2 A_i + \beta_3 H_i A_i - \left(\beta_4 + \beta_5\right) H_i \tag{8}$$

The level of ability in this second population beyond which education is worthwhile is $A_{1,C} = \frac{\beta_4 + \beta_5 - \beta_1}{\beta_3}$ and the proportion of the population who will undertake education is $P_{1,C} = 1 - \frac{\beta_4 + \beta_5 - \beta_1}{A * \beta_3}$. Not surprisingly, with a higher cost of education it will take a higher level of ability for education to be worthwhile, and hence fewer people will choose to undertake education.

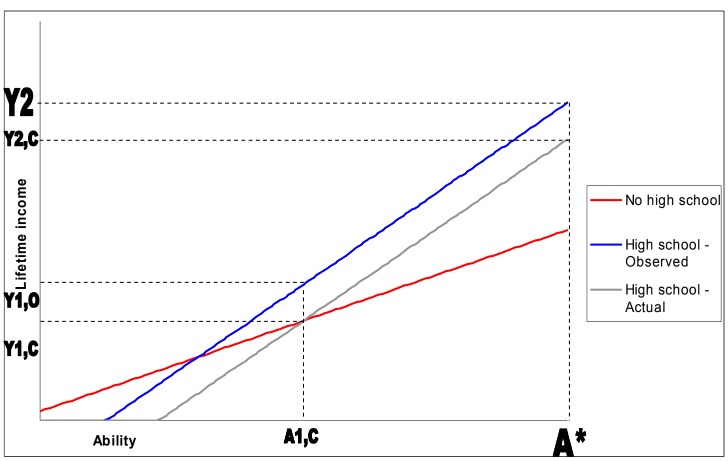
The level of income that corresponds to $A_{1,C}$ is $Y_{1,C} = \beta_0 + \frac{\beta_2\left(\beta_4 + \beta_5 - \beta_1\right)}{\beta_3}$, which is greater than Y_1 from the original model. The level of income for the highest ability person $\left(Y_{2,C} = \beta_0 + \beta_1 - \beta_4 - \beta_5 + A * \left(\beta_2 + \beta_3\right)\right)$ is, however, less than $Y_{2,C}$ from the original model. Finally, given $Y_{2,C} < Y_2$, the benefit of education in the modified model $\left(B_{1,C} = \frac{Y_{2,C} - \beta_0}{2}\right)$ is less than the benefit of education in the original model.

For the researcher, however, β_5 is unobserved. Hence, the researcher will estimate a higher level of net discounted lifetime income for those who complete high school than is actually the case. Observed income for the student corresponding to $A_{1,C}$ and A^* is therefore:

$$\begin{aligned} Y_{1,O} &= \beta_0 + \beta_1 - \beta_4 + (\beta_2 + \beta_3) A_{1,C} \\ &\textit{and} \\ Y_{2,O} &= \beta_0 + \beta_1 - \beta_4 + (\beta_2 + \beta_3) A^* \\ &= Y_2 \end{aligned} \tag{9}$$

This is represented by the following diagram. The darkest line represents income as observed by the researcher, whereas the lightest line represents the actual income that youth expect for themselves.

Figure 3.2 Net lifetime income by ability – Comparing those with an unobserved cost of education



For those who do not complete high school, observed average income will be the same as actual average income. That is, $\overline{Y}_{1,C}\left(H_i = 0, A_i < A_{1,C}\right) = \dfrac{\beta_0 + Y_1}{2}$. However, observed average income for those who do complete high school will be higher than actual income.

That is, $\overline{Y}_{2,C}\left(H_i=1, A_i > A_{1,C}\right)=\frac{\left(Y_{1,C}+Y_{2,C}\right)}{2}$ and $\overline{Y}_{2,O}\left(H_i=1, A_i > A_{1,C}\right)=\frac{\left(Y_{1,O}+Y_2\right)}{2}$, where $Y_{1,O} > Y_{1,C}$ and $Y_2 > Y_{2,C}$. Furthermore, as $Y_{1,O} > Y_1$, observed average income in the population with an unobserved cost of education is higher than observed income in the original population. This is because it is only those with relatively high levels of ability for whom completing high school is worthwhile. Finally, as $\left(Y_{1,O} > Y_1\right)$ the observed benefit of education $\left(B_{1,O}=\frac{Y_2+\left(Y_{1,O}-Y_1\right)-\beta_0}{2}\right)$ is also higher when there is an unobserved cost of education compared to the original specification.

This is not the only reason why there may be a high observed benefit of education, but low levels of participation. Another possibility is that the relationship between ability and net lifetime income is non-linear and there are increasing returns to ability. Under this situation, the majority of the population would be on the flat part of the distribution with the costs outweighing the benefits of education. However, there might be a small minority of the population at the upper end of the ability distribution who have quite high net lifetime income.

3.4.2 Unobserved costs of or barriers to education – Health and transport costs

This extension to the model was motivated by Hollenbeck and Kimmel (2001) who looked at the unobserved cost of education for those with a disability. Zubrick et al. (2006) identified poor health and disability as being one of the main reasons for Western Australian Aboriginal children not attending school. Across Australia, Indigenous children are more likely to suffer from a number of childhood conditions that may make it harder to study at school, including Chronic Suppurative Otitis Media (CSOM) or 'runny ears' (AIHW 2005). CSOM is the chronic condition that results from frequent episodes of middle ear infections (otitis media) which causes fluctuating and often permanent hearing loss. CSOM has been associated with difficulties in schooling, especially for those who are learning English as a second language. Collins (1999, p.150) identifies that ‘hearing loss has a profound impact on a child’s learning’ and notes that this may particularly be an issue for those for whom English is a second language.

Costs related to distance might also be particularly high for Indigenous students. That is, because Indigenous Australians are less likely to live in urban areas, they may have to travel greater distances to attend schools and other institutions (Biddle, Hunter and Schwab 2004). In other words, growing up a relatively large distance from schools has potential costs for those who do choose to study which vary depending on how they undertake that study.

For those who decide to travel to school but remain in their geographical area, there may be daily costs with regard to the commute, either through direct expenditure on transport or as an opportunity cost in terms of time. That is, if these students weren’t travelling, they could be spending the time studying, working in a part-time job or engaged in work around the house.

For those who move to be closer to the schools (either with their family or to a boarding school) there are relocation costs and possibly ongoing boarding fees. These students may also lose the family networks that Smith and Wilson (2002) identified as being an important way for students to find part-time work. Finally, for those who opt to undertake their education via distance there may be set-up costs in terms of materials and equipments as well as costs for private tutors (though these are often heavily subsidised). Furthermore, if parents participate in their child’s home schooling, then this may result in an opportunity cost for the family.

3.4.3 Unobserved costs of education – Social costs

There may also be social costs of schooling that must be weighed against the social benefits. Akerlof and Kranton (2002) discuss a model where students do not make decisions about the amount of effort to put into schooling based solely on future economic return. Instead, students are also concerned with their current social situation and what the authors label identity. A loss in identity leads to a decrease in utility that must be weighed against the potential gains from any increases in skills and hence earnings capacity that education might bring. The authors then infer that this loss in utility could be a reason for why certain types of students are found to under-invest in education.[20]

The authors present several models under which individuals can lose identity, although they all revolve around the hypothesis that a student whose effort levels deviate from the ideal effort level for their social category will suffer a proportionate loss in identity. The scenario presented in Akerlof and Kranton (2002) which is perhaps most applicable for this thesis is concerned with the situation where there is a single ‘school ideal’ based on a desirable set of individual characteristics. A person can either identify with the school ideal or identify themselves as a ‘burnout’. A person whose characteristics fit the ideal category will gain utility from being in this category and choose their effort level to maximise their returns to effort minus the identity loss based on deviations from the prescribed effort level of the ‘ideal’.

Under Akerlof and Kranton’s (2002) specification, a student whose attributes do not meet the ideal has two choices. Firstly, they can identify with the ideal and choose effort levels as above; however, they also experience an identity loss proportionate to the extent to which their attributes fall below the ideal. This identity loss can be thought of as the cost of trying to be someone who they are not. Alternatively, they can choose the burnout identity and not suffer the identity loss from trying to be someone they are not, but nor do they receive the utility gain from being in the ideal group. In addition to choosing an effort level, people who choose this group also choose a disruption level that expresses an alternative identity. This disruption increases their identification with other burnouts; however, it also diminishes the skills gained from their effort at school.

[20] This usage of the term ‘identity’ is somewhat different to that used by Noel Pearson in http://www.theaustralian.news.com.au/story/0,20867,20776119-7583,00.html.

Students who attempt to identify as the school ideal can therefore lose utility in two ways. Firstly, if they do not have the desired characteristics of the school they are likely to be teased and experience alienation. Secondly, if the effort level they put in is different from what the ideal student puts in, they may be labelled either lazy (too little effort) or nerdy (too much effort).

An alternative explanation for why certain population subgroups may face social costs of undertaking education can be found in Austen-Smith and Fryer (2005). Here the authors outline a 'two-audience' signalling model where a minority subgroup faces a trade-off between the higher wages that signalling one's ability to the market place through education might result in with the social stigma one gets from their own subgroup that results from expending time in an activity associated with the majority group. That is, minority groups must trade-off the economic benefits with the social costs of 'acting white.'

The economic model developed by Austen-Smith and Fryer (2005) follows a large body of sociological and ethnographic evidence that certain population subgroups view effort in education as a form of 'selling-out' (Fordham and Ogbu 1986; Baumeister and Muraven 1996; Hirschman, Lee and Emeka 2003). While the extent to which the fear of 'acting white' affects people's actual behaviour is a subject of debate (Cook and Ludwig 1998) that different population subgroups see different social outcomes from undertaking education is generally accepted.

While the models outlined in Akerlof and Kranton (2002) and Austen-Smith and Fryer (2005) were developed in the USA to explain relatively low rates of attendance for the black American population, there are parallels to the Indigenous population that could be made. Purdie et al. (2000) outlined positive identity, or the belief in oneself as being able to succeed, as being one of the key factors for successful engagement between Indigenous youths and mainstream schooling. In particular, the authors identified that for Indigenous students to develop positive self-identity as a student they must see school as being of value and relevance to them. This goes beyond economic value and relates to schools where they have a sense of belonging, teachers who are supportive and a curriculum that is relevant.

The social costs and benefits of education are also likely to be influenced by a person's household context. Those households where someone has had a positive experience with education themselves are likely to be more encouraging of children and youths in the household attending and completing high school and better able to mitigate some of the perceived racism and alienation that constitute a large social cost of education (Schwab 1999). Furthermore, to be successful at late secondary school it is likely to be beneficial to have a quiet area within the home where the student can prepare for exams and assignments. The number of other people in the household combined with the size and quality of the house the student lives in are therefore likely to impact on a youth's desire to continue on at school.

3.5 Other extensions to the model

This section considers several other extensions to the basic model that may help explain the patterns of Indigenous participation in education. The first extension is uncertainty, where students may not accurately know either what their ability levels are, or what the relationship between completing high school and future income might be. The remainder of the section then considers other potential investments that are related to high school education, including investing in alternate forms of education, investing in one's own health or migrating.

3.5.1 Uncertainty

The basic HCM assumes that individuals are able to accurately predict what their future income will be, conditional on whether they do or do not undertake a certain level of education. Although potential students are likely to form their expectations with some degree of information, that information may be limited or incomplete (Dominitz and Manski 1996). Furthermore, if students either utilise or have access to different types of information, their predictions for future income may differ. Smith and Powell (1990) and Rouse (2004) found variation by geography in student's predictions about future income.

If everyone had access to and used the same information, say a nationally representative survey, then every prospective student would predict the same income for a given individual. However, Streufert (2000) questions whether or not individuals do have access to the same information when making predictions about the benefit of education and what the implications might be if they do not. The author assumes that individuals get their information only from individuals who live in their neighbourhood.

If there are a number of people in a neighbourhood with high education levels and high income, alongside individuals with low education levels and low income, then the potential student in that neighbourhood will be able to make an accurate prediction. If, however, there are few people with high incomes and high education levels, then that link might not be apparent. This alone does not predict low education levels for students in poor neighbourhoods. Instead, the key to Streufert's (2000) model is the out-migration from such areas of anyone who has an income level above a certain threshold. This out-migration leads to a top censored distribution with which to undertake the regression upon, leading to youths underestimating the income flow from schooling.[21]

The implications of students using information from those around them to determine the benefits of education is the potential that youth in a number of areas are not able to accurately predict what β_1, β_2 ,and β_3 are. Therefore, at the national level, predicted benefits of education might be high. However, those who live in areas with few people who have completed Year 12 and have high incomes might not be able to see this and hence under-invest in education.

[21] It is not necessary in this model, however, that youths will under-invest in education. The reason for this is that youths take into account not only the benefits from schooling, but also the costs. As high-income role models have left the community, it is likely that youths will under-estimate the opportunity cost, or income foregone, from an additional year of schooling. The effect that dominates is influenced by the parameters of the model, including the future discount rate.

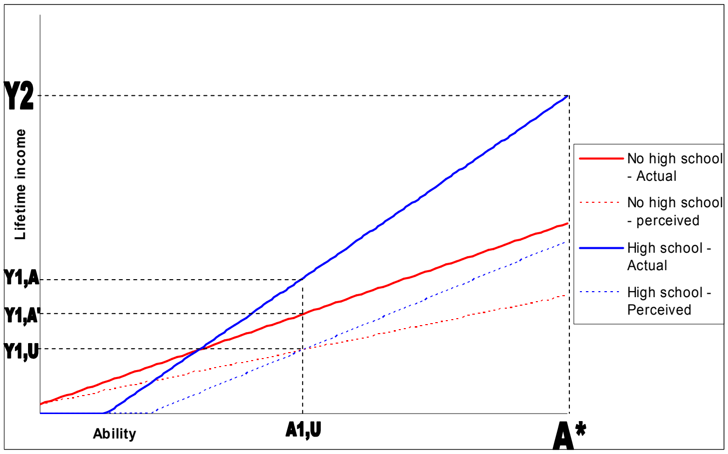
Another source of uncertainty is that individuals may also not be able to accurately predict their own ability. That is, in addition to their actual ability $\left(A_i\right)$, there may be an additional factor $\left(\alpha_i\right)$ which, when multiplied, gives the person's perceived ability. If this uncertainty is unbiased and distributed evenly across the population, then the proportion of the population who decide to attend high school and the predicted benefits of education will not change. However, if one sub-population consistently under-estimates their own ability, then this may have an effect on their decisions and hence the average outcome for that sub-population.[22]

For the sub-population that under-estimates their own ability $\left(0 \le \alpha_u < 1\right)$, the level of actual ability beyond which education is assumed to be worthwhile is $A_{1,U} = \dfrac{\beta_4 - \beta_1}{\alpha_u \beta_3}$. This is higher than in the original specification because a number of potential students who would ultimately have a net benefit from education incorrectly believe that the costs do not outweigh the benefits.

At this level of ability, they would expect their discounted lifetime income to be $Y_{1,U}$; however, it will turn out to be higher than that. If they do complete high school it will be $Y_{1,A} = \beta_0 + \beta_1 - \beta_4 + A_{1,U}\left(\beta_2 + \beta_3\right)$, whereas if they do not it will be $Y_{1,A'} = \beta_0 + A_{1,U}\beta_2$. This is represented by the following diagram, with the dotted lines representing lifetime income given the person's perceived ability, and the bold lines their actual lifetime income.

[22] The accuracy of one's self-perceived ability can be thought of as another aspect of non-cognitive ability. That is, those with higher self-esteem and greater self-awareness are likely to be better able to identify what other types of abilities they possess.

Figure 3.3 Net lifetime income by ability – Sub-Population that underestimates ability

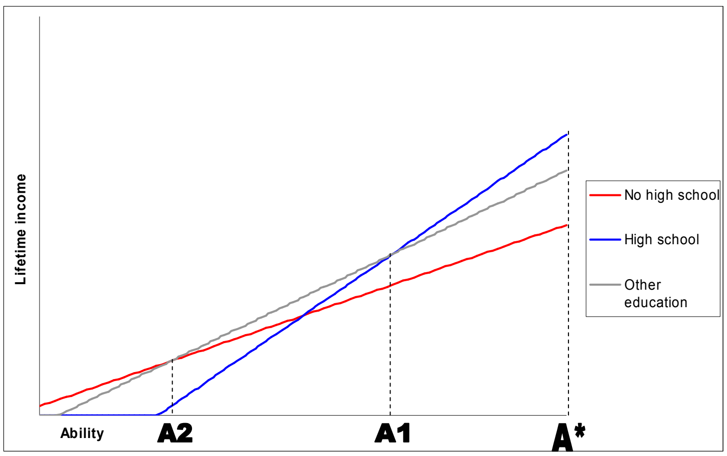


Actual average income will be higher than in the original specification for the non-high school completing population. That is $\overline{Y}_{1,A'}\left(H_i = 0, A_i < A_{1,U}\right) = \dfrac{\beta_0 + Y_{1,A'}}{2}$, where $\left(Y_{1,A'} > Y\right)$. This is because average actual ability in that population is higher than in the original population. Actual average income for the population that does complete high school will also be higher, where $\overline{Y}_{1,A}\left(H_i = 0, A_i > A_{1,U}\right) = \dfrac{Y_{1,A} + Y_2}{2}$. The predicted benefit of education $\left(B_{1,A} = \dfrac{Y_2 + \left(Y_{1,A} - Y_{1,A'}\right) - \beta_0}{2}\right)$ will also be higher, given $\left(Y_{1,A} > Y_{1,A'}\right)$.

3.5.2 Other investments – Choosing the type of education

Until now it was assumed that there is one level of education that individuals choose to invest in, namely whether or not to complete high school. However, in reality, individuals must choose from a range of investments, all of which may have different costs and benefits. If, for example, there is an alternative type of education for which the direct effect on earnings minus the costs of education (observed or unobserved) are higher than for high school education, but the ability related benefits are lower, then this may attract a number of lower ability individuals who would either not otherwise undertake any education or who would only just find high school worthwhile. This situation is represented by the following diagram with net lifetime income for those who undertake this alternative form of education given by the fainter line.

Figure 3.4 Net lifetime income by ability – Alternative education options



According to the above diagram, A_2 individuals will not choose to undertake any of the education options, $(A_1 - A_2)$ will undertake the lower cost alternative and $(A^* - A_1)$ will undertake high school. In the above diagram, because high school education is concentrated even further to the right of the ability distribution, the predicted benefits of completing high school are going to be higher than the predicted benefits of completing the alternative form of education (and higher than the predicted benefits of high school without that education being available).

It may not be the benefits from the particular level of education that motivates people to undertake it, but rather the future educational opportunities that it opens. For example, university education is likely to have a number of economic and social benefits, however to get into university one usually has to first complete and do well at high school. Hence, in addition to the direct benefit of completing Year 12, there may also be an 'option value' of high school (Heckman, Lochner and Todd 2005). For this reason it is important to compare predicted lifetime income from completing Year 12 and going on to university with predicted lifetime income of completing Year 12 only.

3.5.3 Other investments – Investing in health

A person's health status may influence a number of aspects of the model. Firstly, those with poorer health outcomes may have higher costs of education (Hollenbeck and Kimmel 2001). Secondly, those with lower healthy life expectancy have less time to reap the future income benefits of completing Year 12. In addition, health can be seen as an aspect of human capital that people also choose to invest in. In one sense, investing in health takes up resources that could be devoted to investing in education. However, there is also likely to be a fair degree of complementarity between the two whereby investing in one leads to improvements in the other. That is, there is a positive relationship between education and health that individuals might take into account when deciding whether or not to undertake education.

Biddle (2006b) looked at the relationship between education and health for the Indigenous population (see Kennedy 2002 for more general discussion). Firstly, education might lead (directly or indirectly) to improved health outcomes. Directly, education may lead to better health outcomes through increasing a person's health-related knowledge, or alternatively increasing the ability to make efficient use of such information. Indirectly, education might also have an impact on health outcomes through its impact on other intermediate variables which affect a person's ability to obtain health inputs. Those with higher education levels may be better able to obtain employment and for those that are employed, experience more pleasant working conditions and higher wages or other forms of income.

Another intermediate variable that has received attention in the literature is self-control or empowerment (Boughton 2000). According to Ross and Mirowsky (1999, p.446), 'because education develops one's ability to gather and interpret information to solve problems on many levels, it increases one's control over events and outcomes in life.'

Not only do the authors see personal control as having a direct effect on health through the knowledge of the most beneficial actions to take, they also outline how the perception of having control over one's life is also important. That is, if one does not feel that their actions are likely to affect outcomes in their life (because outcomes are determined more by powerful others, luck, fate or chance), then a person may be less likely to undertake actions like exercising, eating a healthy diet and quitting smoking that others might engage in.

For the Indigenous population, an education that leads to a loss of culture may negatively impact on a sense of control and hence health. However, one which is inclusive and hence enhances the individual's control over their lives may also enhance their ability and confidence in taking control over their health (Boughton 2000).

The second explanation for there being a relationship between education and health as outlined in Kennedy (2002) is that there may be a third factor (or set of factors) that is often unobserved by researchers but is associated with both education and health. One possibility is time preference. Those with low discount rates (that is, they value the future relatively highly) are more likely to believe the future benefits of education outweigh the immediate costs (including the income foregone). All else being equal, these people may be more likely to finish high school or obtain post-school qualifications (for a critical review of the time preference literature, see Frederick, Loewenstein and O'Donoghue 2002).

For the Indigenous population, time preference could perhaps be better expressed as confidence about the future. If Indigenous Australians are less confident about the future even before they get to late secondary school, then they are less likely to believe in the efficacy of investing in health and education. However, rather than time preference, a third factor related to health and education that is perhaps more applicable to the Indigenous population is the geographical, language and social barriers to accessing services. That is, the barriers that prevent Indigenous Australians accessing education are likely to affect the barriers to accessing health services in a similar way. This may explain the measured association between education and health for the Indigenous population.

The third explanation for why there is an association between education and health presented in Kennedy (2002) is that healthy individuals are better able to undertake education in the first place. That is, there is a possibility of reverse causality for some health conditions, as measured by the unobserved costs of education that was discussed earlier. Collins (1999) and MCEETYA (2001) also identify poor nutrition (both before school age and once at school) as being another contributing factor to poor education outcomes for Indigenous Australians.

3.5.4 Other investments - Migration

There are a number of different reasons a person might have for moving areas, and the discussion in Chapter 2 showed quite different patterns of migration for the Indigenous population. The basic HCM for migration was developed in Sjaastad (1962), Todaro (1969) and Harris and Todaro (1970). According to this model, migration occurs when the predicted discounted future income stream available at a potential destination is greater than the discounted future income stream at the person's current location plus the costs of migration. The costs of migration are, however, far from negligible. Hence, even if people do predict that there are areas where their income will be higher than it currently is, the increase in their predicted income from moving may not be enough to cover the costs.

The simple model of education participation and outcomes presented in Section 3.2 is in many ways a model that assumes uniform costs of migration across the population. To get the full remuneration from high school participation and one's ability, a person must ultimately be prepared to move to areas where the relative supply and demand of skilled and unskilled labour is most advantageous for their own skills mix. A population with relatively large costs of migration, or one whose social circumstances direct them to areas which are not economically beneficial, might therefore have lower values of β_1, β_2 and/or β_3.

Indigenous Australians may face additional or at least different costs to migration. For example, it may be difficult to find schools to meet the special needs of Indigenous children (Schwab and Sutherland 2003). Also, if Indigenous people want to maintain links with the Indigenous community and their social networks, then they will have to take into account the number of Indigenous people in the area to which they are considering moving.

3.6 Tying it all together – Research questions for the remainder of the thesis

The model outlined in this chapter was designed to motivate the empirical estimations in the remainder of the thesis and to help structure the interpretation of the results. To the author's knowledge at least, it was the first attempt to develop a HCM specifically for the Indigenous Australian population. The two major research questions outlined in Chapter 1 were what the benefits of education for the Indigenous population are and what the factors that are associated with education participation are. To conclude this chapter, this section expands on those research questions and relates them to the model.

3.6.1 What are the predicted benefits of education for Indigenous Australians at the national level?

While the relationship between unobserved ability and schooling makes the estimation of individual components of the model (for example β_1) difficult, it is still important to know at the national level whether Indigenous Australians seem to be benefiting from education as much as the non-Indigenous population. Lifetime income is the main benefit of education used in the model; however, other economic factors like employment probabilities may also be an important consideration. According to Sen (1999, p.21), 'unemployment contributes to the "social exclusion" of some groups, and it leads to losses of self-reliance, self-confidence and psychological and physical health.' This may especially be the case for Indigenous Australians for whom demand constraints would appear to be a particular issue. Furthermore, people may take into account other non-pecuniary effects of education, like health outcomes.

A large part of this chapter was also devoted to why these predicted benefits might vary between the Indigenous and non-Indigenous populations, as well as within the Indigenous population. Therefore, relating the predicted benefits of education to education participation may give insight into whether there are unobserved costs of education for the Indigenous population.

3.6.2 How do the predicted benefits of education vary by geography?

One of the reasons given in this chapter for why there might be variation in the predicted benefits of education is because of geography. Given different resource endowments and localised labour market programs, the relative supply of and demand for skilled and non-skilled labour may be different in different regions, leading to differences across Australia in β_1, β_2 and/or β_3. There are also likely to be a number of potential costs to migration that mean that this variation in supply and demand is not going to even out, at least in the short term. Section 3.5.1 also outlined a situation where having few people in the area who have completed Year 12 and have high income might lead to uncertainty about the parameters of the model and hence underinvestment

3.6.3 Are the predicted benefits of education associated with high school participation?

While the outcomes of education are interesting in how they explain disparities in socio-economic outcomes, the main motivation for developing such a model was to understand participation. However, there is little evidence in Australia regarding the extent to which people respond to such economic incentives, nor whether Indigenous Australians respond in the same way as the rest of the population.

3.6.4 Are other area-level variables associated with high school participation?

The model presented in this chapter also proposes that a number of other characteristics of the area in which a person lives may influence their participation. Individuals are likely to take into account the social costs and benefits of education (β_5) which, as proposed by Breen and Goldthorpe (1997), are likely to be influenced by the level of participation of a person's peers as well as the level of completion of their role models. Furthermore, government programs in the area might also influence the social acceptance of continuing on at school above and beyond the economic incentives.

3.6.5 Are individual and household factors associated with high school participation?

A number of the factors from the HCM outlined in this chapter are likely to be influenced by a person's household context. Some that were mentioned earlier in this chapter were the economic costs of education (including the ability to obtain part-time work) as well as the social costs and benefits. Furthermore, a person's household context may influence the type of area in which they live. Hence, not only are the extent to which individual and household factors associated with participation interesting in and of themselves, when estimating whether the area-level characteristics are associated with participation, it is also important to control for individual and household characteristics.

3.6.6 What are the factors associated with preschool attendance and attendance in non-government schools?

Chapter 3 focussed somewhat on how a person's cognitive and non-cognitive ability influences their educational choices and outcomes from education. While some of the variables used in the estimation for the factors associated with high school participation (in Chapter 7) may be a proxy for ability, unfortunately none of the data sets available on

Indigenous Australians have full measures of either cognitive or non-cognitive ability alongside the other outcomes of interest.

The discussion in Section 3.3.2 outlined how good quality preschool education is likely to be associated with higher levels of cognitive ability once the person reaches late secondary school. While the data used in this thesis does not have information on whether 15 to 17-year-olds attended preschool, it does have information on the current patterns of attendance for those currently of preschool age. Looking at the factors associated with preschool attendance for this age group may give insight into some of the unexplained variation in the patterns of attendance in late secondary school, as well as how attendance at high school can be increased for future generations.

Another factor that might influence the development of a person’s ability is the type of school which a child attends, including whether it is a government or non-government school. Although there is no retrospective information on school attendance for the Indigenous population, it is possible to look at the factors associated with current attendance. This will give insight into how differences in attendance patterns may have an effect into the future.

Chapter 4 Data and geography

The previous chapter outlined a HCM where a person's lifetime income is influenced by their level of school completion, as well as their cognitive and non-cognitive ability. When making the decision of whether or not to undertake education, individuals and their families are assumed to take these economic incentives into account and those with higher expected benefits of education are more likely to choose to undertake education. This general model was modified to take into account a number of factors that may explain variation in attendance between Indigenous and non-Indigenous Australians. This includes unobserved costs of education and uncertainty with regards to their own ability or potential outcomes from education.

From this theoretical model, a number of empirical questions were posed for analysis in the remainder of this thesis. These revolved around two main issues:

- What are the predicted benefits of education for the Indigenous population?
- How are these and other factors associated with participation in education?

To answer these questions empirically, data with a specific set of characteristics are required. The data must have:

Criterion 1 – A sufficiently large and nationally representative sample of Indigenous Australians to obtain robust estimates;[23]

Criterion 2 – Information on education attainment and participation across a number of levels of education; and

[23] For all the data used in this thesis, whether or not a person is Indigenous is determined through self identification. The main implication of this is when making comparisons through time or across surveys as the propensity to identify as being Indigenous has appeared to change substantially with some of this change influenced by the way in which the question is asked (Hunter and Dungey 2003).

Criterion 3 – Information on key outcomes of interest, including employment status and income.

The specific research questions outlined in Section 3.6 focussed on geographic, individual and household variation in participation in and the outcomes of education. In addition to Criterion 1 to 3, therefore, the data should have a range of information which can be exploited for more in depth analysis. That is, it would be preferable for the data to have:

Criterion 4 – A sufficiently large and representative sample of non-Indigenous Australians to compare the results against;

Criterion 5 – Information on where the individual is living, preferably at a reasonably low level of geography;

Criterion 6 – Information on other characteristics of the individual that are likely to influence outcomes of and/or participation in education;

Criterion 7 – Characteristics of a person's household setting, including information on others in the household; and

Criterion 8 – Characteristics of others in the area that the person is currently living in as well as where they lived in the past.

In the absence of the resources to undertake data collection that would simultaneously meet all these aims, the analysis in this thesis relies on secondary use of data already collected. As not one dataset meets all these criteria, there are three collections used: the 2001 Census; the 2002 National Aboriginal and Torres Strait Islander Social Survey (the NATSISS); and the 2001 National Health Survey (NHS).

The remainder of this chapter looks at the three data collections used in detail (in Sections 4.1, 4.2 and 4.3 respectively). In this chapter, the data are discussed in broad terms focussing on the strengths and weaknesses of the data for analysis of education outcomes as well as the issues that need to be kept in mind when interpreting the empirical results in this thesis. In Appendix 4, more specific information on sample characteristics and the exact questions asked in the surveys is presented.

4.1 Census of Population and Housing

The Census of Population and Housing (the Census) is designed to collect information on every person in Australia with the main aim being to obtain a count of the number of people at a given point in time. This count is then used to allocate the number of seats in Federal and State parliaments, as well as financial grants to various levels of government (ABS 2006b).[24] At the same time, a large amount of information is collected on the characteristics of those in the Census which is used for both administrative and research purposes. Because information is collected on such large numbers of people, it is possible to obtain information on very specific population subgroups when analysing the Census.

Since the majority of the analysis using the Census in this thesis is based on the 2001 Census, the main focus of this section will be for that year. The scope and the timing of the 2001 Census will be outlined, followed by the levels of geography that are analysed separately in this thesis. In Section 4.1.3 the questionnaire and collection methodology is discussed with the focus on one aspect of the Census of particular relevance to the study of Indigenous Australians, the Special Indigenous Form (SIF).

---

[24] Although there had been counts of the (non-Indigenous) population since 1788, the first Census in more or less its present for was held in New South Wales in November 1828. From then until 1886, each of the colonies conducted their own Censuses until 1886. A conference held in Sydney on 26 February 1900 arranged for an Australian Census conducted on a uniform basis to be taken on 31 March 1901. However, there were minor differences in the interpretation of definitions between the States and the method of presentation of the results differed considerably (ABS 2000). To provide greater coordination, the *Census and Statistics Act 1905* was passed on the 8th December 1905. This Act provided that 'the census shall be taken in the year 1911, and in every tenth year thereafter'; and 'the census day shall be a day appointed for that purpose by proclamation' (ABS 2000). There was no Census in 1931 due to the depression (it was delayed till 1933) and there was also no Census during World War II (the first post-war Census was 1947). There was a Census in 1954 and 1961 and has been one every five years since (ABS 2000).

Although the results from the 2006 Census will not be available until after this thesis has been completed and submitted, it is important to look at how future analysis may be improved with the availability of this data set. Therefore, Section 4.1.4 looks at the 2006 Census and some of the implications for future analysis of Indigenous education outcomes. Section 4.1.5 discusses the strengths and weaknesses of the Census for analysis of Indigenous education, focussing on how it meets the criteria outlined earlier in this chapter.

4.1.1 2001 Census – Scope and timing

The Census includes information on all people who were in Australia on the night of the 7th August 2001, excluding foreign diplomats and their families (ABS 2000). Visitors to Australia are included, however no additional information beyond their age, sex and marital status is collected (ABS 2001a). Australian residents who were outside the country on the night of the Census are out of scope, as are those on oil and gas rigs. The date for the Census is chosen to ensure that the minimum number of people are away from their usual residence (ABS 2000). Importantly for the analysis in this thesis, this date is also chosen to avoid school holidays for all states and territories. Hence, any information collected will be applicable to when most school and other students are studying.

While everyone in Australia is theoretically in the scope of the Census, in reality not everyone is collected and some are collected more than once. The former is referred to as the under-count and the latter (which in Australia is the lower of the two values) is referred to as the over-count. The difference between the two is the net under-count and is estimated using the Post-Enumeration Survey (ABS 2002b). After taking into account net under-count and controlling for issues around Indigenous identification, the ABS calculates the Estimated Resident Population (ERP). In 2001 the Aboriginal and Torres Strait Islander Australian's ERP counts were 430,800 and 49,000 respectively with the non-Indigenous ERP being 19,025,100. The ERP is used in this thesis as the denominator when using administrative data collections.

4.1.2 2001 Census – Levels of geography

One criterion for a suitable data set in this thesis is to have information on the area in which a person lives and the characteristics of the rest of the population in the area. While most data sets have some geographical information, only the Census has information on relatively small well defined areas, including the rest of the population in the area. The main geographical areas used in this thesis are outlined below.

Collection Districts (CDs)

For the 2001 Census, the basic unit of geography is the Collection District (CD), which is based on the area within which an individual Census Collector delivered and collected the Census forms. CDs are not analysed explicitly in this thesis as they are usually too small to have robust information on the Indigenous population. They do, however, form the building block for the Australian Standard Geographical Classification (ASGC) and the Australian Indigenous Geographical Classification (AIGC). They are amalgamated to construct SLAs, the level of geography that forms the basis of much of the geographic analysis within this thesis as outlined in more detail below.

Statistical Local Areas (SLAs)

The SLA is the smallest geographic unit used by the ABS for the dissemination of most statistical information. Where they exist, SLAs are based on the boundaries of incorporated bodies of local government. Where local government boundaries are too large to enable statistical analysis they are split into two or more SLAs. For example, the local government area of the City of Brisbane is split into 163 SLAs, generally based on suburbs.

In 2001 there were 1,353 SLAs that represent bounded geographical areas and, when migratory and other special purpose SLAs are included, 1,371 SLAs across Australia. The following table gives the number of SLAs for each state and territory, as well as the mean and median number of Indigenous and non-Indigenous Australians per SLA.

Table 4.1 Number of SLAs and number of people per SLA by state and territory

	Number of SLAs	Indigenous		Non-Indigenous	
		Mean	Median	Mean	Median
New South Wales	202	594	334	29,289	10,075
Victoria	201	125	75	22,110	10,945
Queensland	456	247	95	7,189	5,057
South Australia	126	186	77	11,124	7,848
Western Australia	159	368	93	10,687	2,296
Tasmania	47	337	146	9,115	4,912
The Northern Territory	67	759	270	1,876	1,525
The Australian Capital Territory	108	33	30	2,740	2,647
Other	5	46	3	439	302
All of Australia	1,371	299	95	12,831	5228

Source: Customised data from the 2001 Census

For both the Indigenous and non-Indigenous populations, for most states and territories apart from the Australian Capital Territory, the mean number of people in each SLA is a fair bit larger than the median, showing that there are a few SLAs with relatively large populations.

While SLAs form a reasonable basis for the geographical analysis in this thesis, there are a large number of SLAs that do not have sufficient numbers of people to obtain robust estimates for the employment and income benefits of education for the Indigenous population. Hence, for that part of the analysis those SLAs with fewer than ten Indigenous males or fewer than ten Indigenous females aged 15 to 54 years were combined with adjacent SLAs. Where possible, SLAs are combined with others in the same Statistical Sub-Division, the next highest level of geography in the ASGC. More information on this combined geography is given in Appendix 4.

Remoteness and the Accessibility/Remoteness Index of Australia (ARIA)

SLAs represent contiguous, bounded areas. Although within these regions there is some homogeneity, knowing the boundaries themselves does not give any information on the geographical characteristics of the regions. The previous chapter outlined how the distance one has to travel to attend school may be related to the costs of education. While there is no information on the location of schools in the Census, the Accessibility/Remoteness Index of Australia (ARIA) does measure distance by road to populated localities (GISCA 2006) and can be used as a useful proxy.

To measure remoteness, there are three available indices within the family: the original ARIA; ARIA+; and ARIA++. The one used in this thesis, ARIA+ measures the distance from a given geographical point in Australia to each of five types of Service Centres (where the type of service centre is based on its population). The five categories of Service Centres are:

- Service Centre A: 250,000 persons or more.
- Service Centre B: 48,000 – 249,999 persons.
- Service Centre C: 18,000 – 47,999 persons.
- Service Centre D: 5,000 – 17,999 persons.
- Service Centre E: 1,000 – 4,999 persons.

For each point in Australia, the average distance to each of the Service Centres across Australia ranges from 0 if it is in that Service Centre and capped at 3 if it is three times the average distance or more. The summation of these five distances gives the ARIA+ value for that area. The ARIA+ index therefore ranges from 0 for those areas within a Service Centre A to 15 for those areas that are at least three times the average distance to all of the Service Centre types.[25]

An ARIA+ value is created for a grid of 1 km^2 cells across Australia which are then averaged for a given spatial unit. The majority of users of the ARIA+ index (including the ABS) condense the continuous ranges into five categories (six if one includes

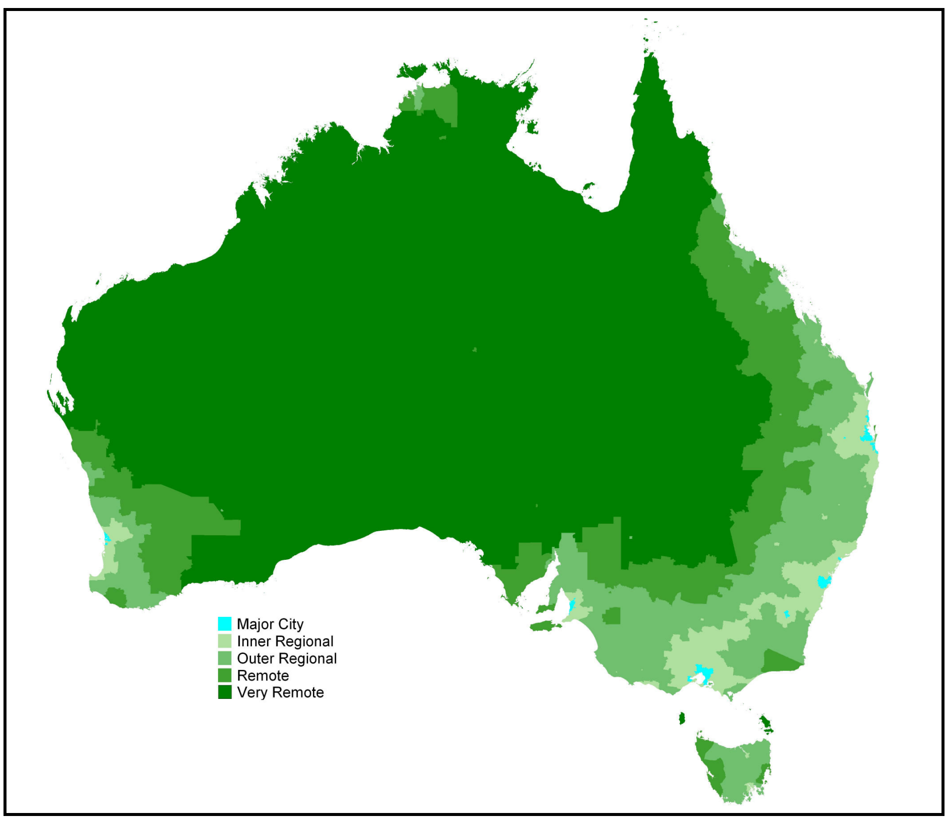
[25] ARIA++ includes an additional category of Service Centre with 200 to 999 people.

migratory and offshore regions). The categories used for Remoteness Areas (from ABS 2001b) are as follows:

- Major cities of Australia: 0 <= Average ARIA+ <= 0.2;
- Inner regional Australia: 0.2 < Average ARIA+ <= 2.4;
- Outer regional Australia: 2.4 < Average ARIA+ <= 5.92;
- Remote Australia: 5.92 < Average ARIA+ <= 10.53; and
- Very remote Australia: 10.53 < Average ARIA+ <= 15.

The following figure maps the five-level classification of the SLA-based ARIA+ index. Those SLAs in blue are those in major cities. The remaining four remoteness regions range from light green in inner regional areas to the darkest green in very remote Australia.

Figure 4.1 Five-level remoteness classification of ARIA+ by SLA



It should be noted that the ARIA+ index and the remoteness classification that is based on it are purely geographical constructs. That is, there is no socio-economic information used in its calculation, nor does it capture rurality. These two concepts are likely to vary by remoteness; however, they are not explicitly incorporated in the measurement.

Measuring CDEP participation at the local level

There are a number of differences between employment in the CDEP scheme and other employment and in Chapter 3 a number of the parameters of the model were identified as potentially varying by CDEP status. To satisfy Criterion 3, the ideal dataset would therefore separately identify those in CDEP employment compared to non-CDEP employment. Unfortunately, in the 2001 Census this only occurred in areas where the Special Indigenous Form (SIF, as outlined in Section 4.1.3) was used. Hence, any individual analysis of employment outcomes using the Census will by necessity include the two together.

The former ATSIC did, however, collect administrative data on CDEP participation which was coded to the postcode in which the person lives. Biddle and Hunter (2006b) used this information to estimate CDEP participation at the SLA by matching postcode-level data on the number of CDEP participants with usual residence data from the 2001 Census.[26] Thus, with regards to geographical analysis as outlined in Criterion 8, the CDEP scheme can be taken into account at least to a certain extent.

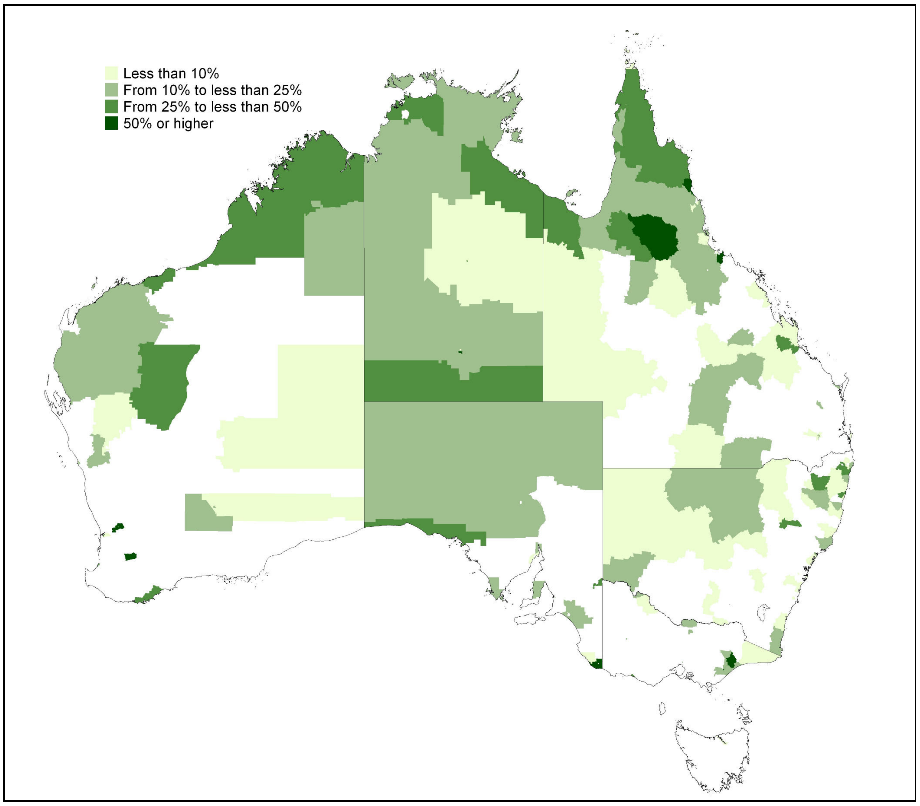
The following map gives the estimated Indigenous CDEP participation rates in 2001 by SLA. Those SLAs that are estimated to have high participation rates are in dark green,

[26] Unfortunately the SLA borders do not always match up well with the postcode borders. That is, there are a number of SLAs that span at least two postcodes, and a number of postcodes that span at least two SLAs. So, to estimate the number of CDEP participants in each SLA in 2001, Biddle and Hunter (2006b) used the ABS concordance that gives the proportion of the SLA population who are in each postcode. Based on these concordances:

- 583 or 43% of applicable SLAs are in one postal area only;
- 219 or 16% of applicable SLAs are in two postal areas;
- 183 or 14% of applicable SLAs are in three postal areas;
- 102 or 8% of applicable SLAs are in four postal areas; and
- 266 or 20% of applicable SLAs are in five or more postal areas.

whereas those with low participation rates have lighter shades of green. Those areas estimated to have no CDEP schemes in the area are in white.

Figure 4.2 CDEP participation rates of Indigenous Australians in 2001 – by SLA



Source: Biddle and Hunter (2006b)

4.1.3 2001 Census – Collection methodology, questionnaire and Special Indigenous Form

Since the 1971 Census when Indigenous Australians were formally included in the counts, the ABS has included progressively more detailed special arrangements to ensure the most accurate and detailed information is collected on Indigenous Australians. Although the Indigenous Enumeration Strategy is multi-faceted and includes strategies to collect the most accurate information in urban and regional areas, perhaps the biggest impact is the use of the SIF for a number of Indigenous Australians in remote and very remote Australia.

The major differences between the way in which information is collected in the remote and very remote areas the strategy employed in the rest of Australia is the use of interviewers rather than a self-enumerated form, occasional variation in the day on which information is collected (though information should still, in theory, refer to the 7th of August) and the use of a streamlined form. While the first two issues are likely to introduce differences in the reliability of information gathered in the applicable areas, the last issue may introduce a bias for which the direction may be predictable.

Table 4.2 presents the questions used for six of the main areas of information used in this thesis. In the table, the second column gives the questions used on the SIF (from Martin et al. 2002) and the third column the questions used on the standard form (from ABS 2001a). The last column outlines any other differences on the form (either in the response categories or the instructions given to respondents). Any use of *italics* is from the original questions.

Table 4.2 Differences between the Special Indigenous Form and the standard Census form

Subject	Special Indigenous Form (SIF)	Standard form	Other differences
Usual residence and migration	Q7 Do you live at this place most of the time? (if no asked to give address) Q8 Did you live at this place most of the time one year ago? (if no asked to give address) Q9 Did you live at this place most of the time five years ago? (if no asked to give address)	Q7 Where does the person usually live? Q8 Where did the person live one year ago (at 7 August 2000) Q9 Where did the person usually live five years ago (at 7 August 1996)	Respondents to the SIF are prompted in Q8 and Q9 about the dry season
Language spoken at home	Q14 Do you speak an Aboriginal or Torres Strait Islander language *at home*?	Q15 Does the person speak a language other than English *at home*?	Respondents to the standard form are prompted for six other languages and have a space for other. Respondents to the SIF are asked to give the Aboriginal or Torres Strait Islander language
Educational attendance	Q19 Do you go to school, TAFE or University Q20 What type of school or place of education do you go to	Q22 Is the person attending a school or any other educational institution Q23 What type of educational institution is the person attending	Respondents to the SIF were prompted to "include school of the air, external or correspondence" students whereas those on the standard form were only prompted to "include external or correspondence students"
Non-school qualifications	Q23 Have you *finished* a trade certificate/apprenticeship, TAFE course or university course since leaving school Q24 What is the name of that course Q25 What did you study Q26 What was the name of the place you studied at	Q26 Has the person completed a trade certificate or and other educational qualification Q27 What is the level of the *highest* qualification the person has *completed* Q28 What is the main field of study for the person's *highest* qualification *completed* Q29 At what	

		institution was the person's *highest* qualification *completed*	
Income	Q28 How much money do you get each *fortnight* before tax	Q31 What is the gross income (including pensions and allowances) that the person usually receives each week from all sources?	There are fewer income categories to choose from on the SIF Those using the standard form are prompted to include a much larger range of income types (though not CDEP money like on the SIF) and are specifically asked to *not* deduct tax, superannuation and health insurance
Employment	Q29 Did you have a paid job *last week* Q37 Did you look for work at any time in the *last four weeks* Q38If you had found a job, could you have started work *last week*?	Q32 *Last week*, did the person have a full-time or part-time job of any kind? Q42 Did the person actively look for work at any time in the last four weeks? Q43 If the person had found a job, could the person have started work last week?	On the SIF, respondents to Q29 are asked whether they worked for the CDEP scheme or otherwise. For the standard form, there was no mention of the CDEP scheme.

Source: ABS (2001a) and Martin et al. (2002)

The first difference between the two questionnaires that is potentially problematic is that on the SIF, respondents are asked whether they go to 'school, TAFE or University' whereas on the standard form they are asked only whether they are attending school or another institution. Because TAFE or University education is specifically mentioned, those who attend these two types of institutions may be more likely to identify as such. However, because preschool is not mentioned, those who are attending preschool may be less likely to be identified as doing so using the SIF.

The second major difference is in the income question. On the SIF, fortnightly income is asked whereas on the standard form weekly income is asked. Another difference in the income questions is that CDEP money is specifically mentioned in the SIF, whereas on the standard form it is not. Furthermore, on the SIF a smaller range of income categories are given for people to select from which may reduce the measured variation in income in areas where the SIF is used.

The final major difference between the forms for the purposes of this thesis is that, as mentioned previously, on the standard form no information is collected on whether a person worked in the CDEP scheme. On the SIF, on the other hand, a separate category for this type of employment is given in Question 29. While this obviously precludes analysing CDEP scheme participation at the individual level using the Census, there is also the potential problem that total employment is under-reported in non-SIF areas because respondents employed in the CDEP scheme may not be sure whether to record that they are indeed employed.

Although all individuals in the scope of the Census are required to answer all relevant questions, in reality a number of people do not respond to individual or groups of questions. This non-response is much higher in the Census because it is a self-enumerated form and hence there are no interviewers present to encourage people to answer each and every question. Some possible reasons for non-response include not understanding the question, thinking that the question was not applicable to the person filling out the form or making a conscious decision not to answer the question.

Two questions that are used extensively in this thesis that had a high non-response rate in 2001 are those on income and the highest year of school completed. Of the applicable population (those aged 15 years and over), 7.7% did not answer the income question and the same percentage did not answer the schooling question. While the former may have had a relatively high non-response because of people's concerns about privacy, 2001 was the first time that the latter was asked and hence individuals may have been unsure about the question (until 1996 the question was on age left school).

The non-response rate for the Indigenous status question (4.1%) was around the average for all questions in the Census. While this is promising for the analysis of Indigenous outcomes, it should be pointed out that almost twice as many people did not answer the Indigenous status question (767,757 people) as there were individuals who identified as being Indigenous (410,003).

In this thesis, no attempt is made to impute values for the 'not stated' categories and those who did not answer a question relevant to a particular analysis are excluded from any analysis that uses that particular question. For example, those who did not state their income are not excluded from the analysis of employment outcomes. For this reason, sample sizes vary depending on the questions included in the analysis; however, were applicable, sample sizes are given with the tables of results.

4.1.4 Changes between the 2001 and 2006 Censuses

Although the 2006 Census has already been undertaken, results are not yet available for analysis.[27] Chapter 9, however, discusses potential future analyses that will only be possible once 2006 data are available. Hence, it is important to discuss some of the changes that occurred between the 2001 and 2006 Censuses. Before talking about the changes, however, it is important to note that one of the most useful things about the 2006 Census is the relative consistency of the highest year of school completed question. Given the change in the education question between the 1996 and the 2001 Censuses, the consistency between the 2001 and the 2006 Censuses will, for the first time, enable analysis of changes through time in high school completion. It may also be possible to undertake a cohort style analysis using this question, which may be useful in the calculation of returns to education.

One change to the 2006 Census that may reduce the scope for analysis is the question on the year of completion of a person's highest qualification. Respondents are now only asked whether they completed the qualification before 1998 or from 1998 onwards. This was designed to get more accurate information on the type of qualification a person

[27] Census Tables will not be available until October 2007 and unit record data will not be available for analysis until March 2008.

obtained. However, analysis of the style undertaken in Biddle (2006c) and reported in Chapter 2 will no longer be possible.

The 2006 Census will see the return of a question on the number of children ever born (for females). While there was a question on this topic in most Censuses up to and including 1986, at that point it was decided that it was not necessary to collect such information every five years. Hence, there was no question in 1991 and 2001; however, there was in 1996. As will be shown in Chapter 5 using an alternative data source, fertility patterns have a strong influence on the benefits of education for females. Hence, the incorporation of such a question in the 2006 Census will potentially allow estimates for the benefits of education that take into account childbirth.

In addition to the changes in the existing Census questions, the 2006 Census has two additional sets of questions that have never been asked before and may be useful in analysing the socio-economic outcomes of Indigenous Australians. The first set is a new topic on the need for assistance. Four new questions will be asked, based on a reduced set of questions from the ABS Survey of Disability Ageing and Carers (ABS 2005). The first three ask whether a person ever needs someone to help with or be with them for three types of activities. The final question asks the reasons for the need for assistance or supervision identified from the previous questions. These new questions may enable an analysis of the relationship between health and education to supplement the analysis possible in the National Health Surveys (perhaps at the sub-national level).

The other new set of questions on the Census is on unpaid work. There are four questions in this topic that ask information on four distinct types of unpaid work. These are: unpaid domestic work; unpaid care for family members; time looking after children; and voluntary work through an organisation or group. People in certain population subgroups or areas may not appear to have high predicted income or employment benefits of education because they are instead choosing to do alternative activities. By including questions on unpaid work it will therefore be possible to construct more inclusive benefits of education.

4.1.5 Strengths and weaknesses of using the Census to analyse Indigenous education

There are a number of strengths and weaknesses when it comes to using the Census to analyse the outcomes of and participation in education for the Indigenous population. On the positive side, there are no other data sets that have detailed information on as many people as the Census. This is quite important for analysing the Indigenous population, however it also means that there can be reasonably robust analysis within the Indigenous population. This includes detailed education comparisons, as well as analysis of outcomes by small levels of geography (thereby meeting Criteria 5 and 8).

The Census is not an Indigenous-specific collection. This means that there is also a large sample of non-Indigenous Australians to compare the results against. This will show the potential improvements in certain outcomes plus, given a number of outcomes only have meaning when compared to a benchmark, comparing to the non-Indigenous population will highlight the circumstances of Indigenous Australians that are of particular concern.

There is, however, a cost of using a data source that is not specific to the Indigenous population, including the possibility that the questions aren't always going to be worded in a way that allows them to be understood by all parts of the Indigenous population as well as they might be. This is ameliorated to a certain extent through the use of the SIF; however, this was not used by all Indigenous Australians and hence there are issues in terms of comparability. In addition, the questions asked may not always best serve the goals and desires of the Indigenous population. For example, one of the benefits of education looked at this thesis is the ability to obtain full-time employment. However, this employment may come at the cost of other cultural activities that are not captured in the Census.

Criterion 7 identified information on a person's household setting as a desirable characteristic of data used for analysis in this thesis. This is especially the case when looking at the outcomes of children and youth who are undoubtedly influenced by the characteristics of their parents and other household members. Because information is collected on everyone in the household on the night of the Census, one of the strengths of the Census is therefore the ability to very flexibly control for household information. There is a cost of using a household based form in that those who are recording the information may not know all the details of others in the household with complete accuracy.

Though there are questions on education attainment and participation (thereby meeting Criterion 2) as well as employment status and income (Criterion 3), the questions are somewhat limited and do not give as accurate information as would be available on a specially targeted sample survey. For example, CDEP employment is not separately enumerated for all those in the Census so any analysis on employment must include both CDEP and non-CDEP employment together.

Because of these weaknesses in the Census, analysis of specially targeted sample surveys should be used to supplement analysis of the Census. The next section outlines one such dataset.

4.2 National Aboriginal and Torres Strait Islander Social Survey (the NATSISS)

As mentioned above, one of the major limitations of the Census is that it is not designed to collect detailed socio-economic information, nor is it designed specifically for the Indigenous population. Because of these issues, in 1991 the Royal Commission into Aboriginal Deaths in Custody recommended a national survey of the Indigenous population (Commonwealth of Australia 1991). It was the dearth of information with which to inform the Royal Commission that resulted in the first National Aboriginal and Torres Strait Islander Survey in 1994 (NATSIS). This survey provided the first nationwide inter-censal estimates of Indigenous socioeconomic status.

The 2002 NATSISS is the second major nation-wide 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. Some of the information had never been collected before for the Indigenous population, whereas a number of the questions were broadly comparable to the 1994 NATSIS or the 2001 Census.

The 2002 NATSISS was also 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). Many of the data items in the 2002 NATSISS are comparable with the GSS; however, the GSS did not collect information in very remote areas and was limited to individuals 18 years and over.

The 2002 NATSISS was designed to 'enable analysis of the interrelationship of social circumstances and outcomes, including the exploration of multiple disadvantage' (ABS 2005). Information is provided across a range of topics. These are:

- demographic characteristics of the individuals and household and geographical characteristics of the area in which they live;
- cultural and language information and the family and community context;
- health and disability;
- education participation and achievement;
- employment;
- income, housing and financial stress; and
- Information technology, transport and law and justice.

Because of this range of information and the fact that it is specifically targeted to the Indigenous population, the 2002 NATSISS is used for a number of cross-tabulations in Chapter 2 and is also used in Chapter 5 to look at variation in the predicted benefits of completing high school for the Indigenous population. This section outlines a number of characteristics of the survey including scope, the sample selection and survey design. There is also discussion of some of the limitations of the survey that reduce the potential range of analysis.

4.2.1 Scope of the survey

The 2002 NATSISS collected information from Indigenous Australians aged 15 years and older who were usual residents in private dwellings at the time of the survey. As is the standard in ABS household surveys, the survey excludes visitors to the randomly selected private dwellings. The survey was carried out across Australia with the aim of collecting enough information to make conclusions at either the state/territory level or by the ARIA+ remoteness classification.

The coverage of the 2002 NATSISS data is different from that in the GSS (which only collected information on those aged 18 and over in private dwellings) and also different from that of the 1994 NATSIS (which collected information from persons aged 13 years and over in both private and non-private dwellings). The difference in age structures is reasonably easy to take into account by re-weighting, though it should always be kept in mind during comparative analysis. However, given that the 2002 NATSISS did not collect information on people in non-private dwellings, differential coverage may be more problematic when making comparisons with 1994 NATSIS or the 2001 Census, or when making conclusions on the total Indigenous population. Biddle and Hunter (2006c) give more detail on the implications of not collecting information on private dwellings when making comparisons between the 1994 and 2002 surveys.

4.2.2 Sample selection and survey design

There were two components to the 2002 NATSISS sample design, which in combination enabled the survey output objectives to be met (that is to provide reliable estimates at the national level and for each state/territory). The first was based on a sample of discrete Indigenous communities and the outstations associated with them. This is the Community

Area (CA) sample. In the remainder of Australia the survey methodology and sample design was somewhat different. The data from these other areas are described as the Non-Community Area (NCA) sample. Around 30% of the sample came from the CAs and 70% from the NCAs. Those in NCAs were interviewed using Computer Assisted Interviewing (CAI), whereas those in CAs were interviewed using Pen and Paper Interviewing (PAPI).

The differences between survey questions and survey technique in the CA and NCA samples raise the most important issues for the analysis of 2002 NATSISS data. However, before moving on to the CA and NCA survey design, it is important to make clear the difference between the CA sample and the concept of remote areas, as this is often confusing in the data documentation. The sampling in non-remote areas (that is major cities, inner regional and outer regional areas) was carried out entirely under the NCA methodology. This included 5,242 of the surveyed individuals. In remote areas (which includes the remote and very-remote ARIA+ classifications), both CA and NCA sampling methodology was used. Remote areas that were not identified as 'discrete communities' used the same sampling methodology and interviewing techniques as were used in non-remote areas (i.e. NCA methodology). In remote areas where NCA methods were used, there were 1,997 respondents.

4.2.3 Questionnaire design and output

Although the questions in the CAs and NCAs were broadly similar, there were still differences in what was asked, and the way the data was outputted by the ABS. The variables that were affect by such decisions are listed in Table 4.3 and can be classified into three main categories: those variables which were collected in both CAs and NCAs but have different output categories; those which were collected in NCAs only; and those that were collected, but not released in remote areas.

Table 4.3 Differences in data collection in CA and NCA areas

Restriction	Variable
Collected in both NCAs and CAs, with different categories outputted in remote areas	Main reason for last move Type of stressor in last 12 months Type of social activities in last 3 months Presence of neighbourhood/community problems Neighbourhood/community problems Whether used formal childcare in last 4 weeks Type of childcare used in last 4 weeks Main reason for not using (more) formal child care in last 4 weeks Type of organisation undertook unpaid voluntary work for in last 12 months Disability status Tenure type Type of major structural problems All sources of personal income Principal source of personal income Where used computer in last 12 months Where used Internet in last 12 months Modes of transport Type of legal services used Attendance at cultural events in last 12 months* Self assessed health* Type of government pension/allowance (auxiliary)* Whether working telephone at home*
Collected in NCAs only	Whether has an education restriction Whether has an employment restriction Disability type Multiple job holder Cash flow problems All types of cash flow problems Number of types of cash flow problems
Collected, but not released in remote areas	Whether ever used substances Type of substances ever used Whether used substances in last 12 months Type of substances used in last 12 months

Source: ABS (2005)

Notes: An * refers to variables where the only difference between the CAI and PAPI samples is the presence or absence of a ‘not stated’ option.

The disability variables in Table 4.3 warrant special mention as variation in the predicted benefits of education by disability are calculated in Chapter 5 but quite different variables were constructed for the NCA and CA samples. As a result of field testing and consultative processes, data items and questions for disability (plus a few other topics) were modified to take account of language and particular circumstances of people living in very remote communities. In addition, Indigenous stakeholders advised that attempts to measure psychological disabilities in remote communities required development of an appropriate instrument sensitive to the circumstances of people in these areas.

Full disability was collected in NCAs, and this is comparable to data items in the GSS. A modified set of disability questions that did not include psychological disability was collected in CAs. This question was combined with the relevant options from the NCA sample to create a new variable which can be used across both samples (see ABS 2005). This is the variable that is used in Chapter 5 of this thesis.

Not only were some of the questions different in the CAs and NCAs, so too were the interviewing techniques. As indicated above, interviews in NCAs were conducted using CAI where interviewers use a notebook computer to read the questions and to record the data gathered. If respondents were asked to choose from a range of options, then prompt cards were used. For the substance use questions, a voluntary self-enumerated form was used with a response rate of 90%.

In CAs, the surveying techniques were modified to take into account the cultural and language differences predicted for these areas. Firstly, the interviewing was conducted by more traditional PAPI. In addition, Community Information Forms (CIFs) were used to collect information about the community from the local council office. For each community, Indigenous facilitators were used to improve the validity of the data. However, not all interviews in CAs were conducted in the presence of facilitators. These facilitators 'explained the purpose of the survey to respondents, introduced the interviewers, assisted in identifying the usual residents of a household and in locating residents who were not at home, and assisted respondents in understanding questions where necessary' (ABS 2005). While the differential use of facilitators may have introduced potential interviewer bias in the response to some of the questions, accurate records were not kept by the ABS as to when facilitators were used. Accordingly, it is not possible to control the analysis of 2002 NATSISS for the effect of the presence of facilitators.

One of the main issues with analysing the publicly available Confidentialised Unit Record File (CURF) is that those individuals survey in the CA sample are not separately identified from those in the NCA sample. While this is not an issue if the analysis is constrained to the non-remote population, if the remote population is included then there is the distinct possibility of non-sampling error due to differences in the way in which the questions were asked and in the case of those variables presented in Table 4.3, the questions themselves. This is particularly problematic with those variables for which information is collected in the CA sample only. That is:

- Type of social activities in last 3 months
    - Attendance at ATSIC or Native Title meetings
    - Funerals, ceremonies or festivals
    - Fishing or hunting in a group
- Whether used formal childcare in last 4 weeks
    - No access to formal childcare
- Main reason for not using (more) formal childcare in last 4 weeks
    - Service not available

For these five variables, it is impossible in the NATSISS CURF to identify the proportion of the sample to which they are applicable. These variables are therefore not analysed in this thesis. In addition, there were sequencing errors in the section of the NCA questionnaire on education, and the ABS needed to impute values for these variables based on the responses to other questions and information from the 2001 Census. The first sequencing error affected the 733 respondents aged 20 to 24 who were not studying full-time. These individuals were not asked whether they were currently studying, nor were they asked the type of education institute they were attending. An additional sequencing error occurred with the 1,399 respondents who had used employment support services in the last 12 months. These individuals were sequenced past four questions on vocational training. These variables were therefore also not used in this thesis.

4.2.4 Strengths and weakness of using the 2002 NATSISS to analyse Indigenous education

The major strength of the 2002 NATSISS is that, because it is specifically targeted towards the Indigenous population, a range of information that is particularly relevant to this thesis is collected. Most importantly, unlike in the Census, employment in the CDEP scheme is identified separately. Other information collected that is likely to have an influence on education outcomes and participation (Criterion 6) that is not available on the Census is disability status and a number of social or demographic variables (including the number of children a female has had).

While the education variables are quite similar to those asked in the 2001 Census, unfortunately there is no information in the 2002 NATSISS on when a person obtained there qualifications. This would tend to reduce the accuracy of predicted benefits of education for post-school qualification and hence analysis using the NATSISS focuses on high school education only. Furthermore, like in the Census, no information is collected on cognitive or non-cognitive ability.

One of the limitations of the 2002 NATSISS that is common with most sample surveys is that the geographical information is limited. However, one additional problem with the CURF version of the Census is that it is not possible to separate those in remote Australia from those in very remote Australia. Figure 4.1 shows that very remote Australia makes up a large proportion of the Australian continent and Chapter 2 shows that in these parts of Australia the proportion of the population who were Indigenous was quite high compared to the rest of Australia. Furthermore, analysis of Census data in subsequent chapters of this thesis shows considerable variation in employment, income and education outcomes between remote and very remote Australia. Unfortunately it is not possible to capture this variation using the publicly available CURF.

Using a survey targeted towards the Indigenous population obviously has the cost of not having a non-Indigenous population to make comparisons against. While the 2002 GSS allows some comparisons to be made, these are restricted to those aged 18 years and over, non-remote Australia and to comparable data items.

4.3 The National Health Survey (NHS)

The discussion of the theoretical model developed in Chapter 3 identified a person's health status as a potential benefit of education. There is, however, no information on health outcomes or health behaviour in the 2001 Census and, although there are some questions in the 2002 NATSISS, those questions are limited and not entirely robust (Chikritzhs and Brady 2006). The final dataset that is used for the analysis presented in this thesis is therefore the 2001 National Health Survey (NHS),[28] carried out by the ABS. In this survey, a large range of health information was collected across Australia, as well as a number of other data items that could be expected to vary along with a person's health status. In addition to the Indigenous Australians collected in the normal sample, there was also an additional Indigenous supplementary sample that when combined allowed robust estimates for the Indigenous population.

The 2001 NHS had two components, the survey for the general population, NHS(G), and the Indigenous supplement, NHS(I). The NHS(G) was conducted in urban and rural Australia between February and November 2001 and collected information from 17,918 private dwellings (ABS 2003a). For those households surveyed, information was collected on one random person aged 18 years or over, all children aged 0 to 6 years in the household and one child aged 7 to 17 years (if there were any present). This resulted in 26,863 persons who fully responded to the survey, of which 483 were Indigenous. The NHS(I) covered all of Australia and collected information on 3,198 Indigenous adults and children. A total of 2,124 of these were collected in non-remote, non-sparse Australia, 603 in remote, non-sparse Australia and 954 in remote, sparse Australia.[29]

[28] While the 2004-05 NHS and the 2004-05 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) include a much larger sample size than the 2001 NHS(I) and NHS(G), the unit record file was not available in time to be used in this thesis.
[29] Sparsely and non-sparsely settled areas are geographic terms that were used for sample design for the 2001 survey but were superseded by the remoteness classification for output reasons. A sparsely settled

In the NHS(G) and non-sparse part of the NHS(I), dwellings were selected using stratified multistage area sample. CDs were selected based on the estimated number of people in them (Indigenous people for the NHS(I)) with dwellings chosen at random for the NHS(I) and by blocks and then randomly chosen non-contiguous dwellings in the NHS(G). In the sparse NHS(I), the sample was obtained from a random selection of discrete Indigenous communities and outstations across Australia using information collected in the 1999 Community Housing and Infrastructure Needs Survey. Within selected communities and outstations, a random selection of dwellings was made.

Both the NHS(G) and NHS(I) were conducted via face-to-face interviewing. Each adult undertook a separate interview with child proxies (a responsible adult) used to collect information on children. For the NHS(I) non-sparse areas, children aged 15 to 17 years were either interviewed themselves (if the parent or guardian gave permission) or had their information collected from a child proxy as per the NHS(G).

At the conclusion of the interviews for the NHS(G) and non-spares NHS(I), adult women were asked to fill in an additional questionnaire relating to women's health issues. They filled this out themselves and returned it in a sealed envelope. In the sparse NHS(I) sample, this information was collected by a female interviewer.

The NHS(G) and non-sparse NHS(I) used almost exactly the same questionnaire, with the exception being that the latter did not collect information on mental health issues, country of birth (this was coded to Australia by the ABS) and year of arrival.

The next four chapters present the results using these data sets.

---

area is an SLA in which the dwelling density was less than 0.057 dwellings per square kilometre. Non-sparsely settled areas are all others.

Chapter 5 The predicted benefits of education for Indigenous Australians

One factor that people may take into account when deciding whether or not to undertake study is the effect it has on their economic status. Chapter 2 showed that Indigenous Australians are undertaking education at much lower rates than the non-Indigenous population. One reason for this may be the relative economic incentives to do so.

Chapter 3 discussed a number of potential reasons why the benefits of education might vary between Indigenous and non-Indigenous Australians. Firstly, Indigenous Australians might have access to different labour markets than the non-Indigenous population and therefore there may be different relative demand for skilled and unskilled Indigenous labour. There may also be different costs of education that Indigenous Australians have to trade off against the benefits. This includes the economic costs of education (primarily income foregone whilst studying) as well as the social costs and barriers to education. Finally, the Indigenous population may have a quite different distribution of ability compared to the non-Indigenous population.

Given the potential role of economic incentives to influence education participation, it is important to have an understanding of the predicted benefits of education for the Indigenous population. This will not only test one potential reason for low participation, but will also give some insight into what scope there is for increased participation in education, leading to a reduction in socio-economic disadvantage.

This chapter focuses on two potential economic benefits of education that people are likely to take into account. That is, their ability to obtain employment and, once employed, obtain a job that is relatively well paid. Within these two areas there are six potential outcomes that may be improved from education analysed in this chapter. This includes the relationship between education and the probability of being: employed; being employed full-time; and being employed as a manager, professional or semi-professional (labelled for convenience as 'high status occupations'). For those who are employed and those employed full-time, the relationship between education and income is also examined. However, people may take into account what income they would receive if they were not employed and hence the relationship between education and income is examined for the total employed and not employed population together.

There have been several studies that looked at the predicted benefits of education for Indigenous Australians (as discussed at the start of Section 5.2). These studies, however, either do not use the most recent data, focus on one particular outcome only (for example employment) or do not consider a range of education options. The results in this chapter therefore update the literature with more recent data (the 2001 Census and the 2002 NATSISS), and present and contrast a number of potential outcomes from education.

Just as there may be variation in the predicted benefits of education between the Indigenous and non-Indigenous populations, there may also be variation within the Indigenous population. Identifying those Indigenous population subgroups who have relatively low or high predicted benefits of education will help identify subgroups that may have low economic incentives to undertake education as well as give some insight into the benefits of education estimated at the national level. After outlining the method to do so in Section 5.3, in Section 5.4 the predicted benefits of high school education are estimated by remoteness classification, sector of employment, disability status, English language skills and childbirth.

While employment and income are important aspects of a person's socioeconomic status and determine to a large extent their access to resources, there are a number of other important outcomes that education might influence. In 5.5 the concept of capabilities is used to summarise the chapter and discuss other potential benefits of education. Based on this discussion, empirical evidence is presented looking at the relationship between high school education and health.

5.1 Income and employment benefits of education – Method

This section looks at the method used to estimate the benefits of education in Australia for Indigenous and non-Indigenous Australians. The underlying methodology is to first estimate the relationship between education and employment or income by age for the current adult population. The predicted benefits of education for a person contemplating education is then estimated to be the difference in lifetime employment or income assuming that this relationship will hold into the future. Before outlining the method in detail, the education variables used are discussed below.

The simplest measure of education that is used in this chapter is whether or not a person has completed Year 12. This is somewhat different to previous research looking at the predicted benefits of education for the Indigenous population which have focussed on the predicted benefits of an extra year of high school. However, this may have been motivated in part by previous Censuses having information on 'age left school' as opposed to highest year of school completed. Completing each year of school is likely to bring about additional benefits to the individual, and in Section 5.4 results are given for the benefit of completing Year 10.

In addition to making the analysis more tractable, a focus on Year 12 is useful because first, for a number of jobs, a Year 12 or equivalent education is the absolute minimum entry requirement. Secondly, Year 12 completion is a prerequisite for direct entry into university and a number of other post-school options.[30]

Non-school qualifications may also impact on future outcomes. Not only are university qualifications required for a number of professions, other skilled qualifications are also likely to enhance one's earnings capacity and increase the chances that a person is able to

[30] By looking at the benefits of completing Year 12 as opposed to an extra year of schooling, then the productivity benefits of education will be included alongside any signalling or 'sheepskin effects' (Hungerford and Solon 1987). However, because one of the focuses of this thesis is the motivation to undertake education, not just the direct contribution of education to income, it is appropriate to include these two together. The different sheepskin effects for minority groups reported by Belman and Heywood (1991) is, however, a potential explanation for any differences in the benefits of education.

obtain employment. It should be noted that, because of data constraints, the analysis in this and subsequent chapters that uses the Census as the main source of data treats CDEP and non-CDEP employment together. In this chapter, those who have completed Year 12 are assumed to have the choice of obtaining a degree at university or alternatively obtain some other non-school qualification (for example a certificate or diploma). Individuals may not pursue any further studies and therefore are classed as having a 'Year 12 only' education. Those who did not complete Year 12 are assumed to only be able to obtain a non-degree qualification.[31]

In this part of the chapter, individuals are therefore grouped at two levels of aggregation. In the broader breakdown, two categories of people can be set up: those who finish Year 12; and those who do not. By taking non-school qualifications into account, these two categories can be further divided into five sub-categories. The proportion of Indigenous and non-Indigenous males and females who fall in each of these categories is given in the following table.

Table 5.1 Proportion of the population 15 years and over by education level, Indigenous status and sex – 2001

	Indigenous		Non-Indigenous	
	Male	Female	Male	Female
Currently a high school student	5.55	5.55	3.64	3.62
Has left school but did not complete Year 12	76.70	75.51	55.05	54.94
Has left school and completed Year 12	17.76	18.94	41.31	41.43
High school or post-secondary student	15.07	17.29	14.03	15.35
Did not complete Year 12 and no qualifications	59.93	61.06	31.34	42.55
Did not complete Year 12 and has qualifications	11.10	6.06	19.71	7.23
Completed Year 12 and no qualifications	8.20	9.24	12.19	13.27
Completed Year 12 and has a degree	2.12	3.17	12.46	13.18
Completed Year 12 and has other qualifications	3.58	3.18	10.27	8.41

Source: Customised data from the 2001 Census

[31] There is a small minority of individuals who report having a degree despite saying that they did not complete Year 12 or equivalent. This is likely to include those who study as mature age students or those who have received honorary doctorates. These individuals are grouped with the Year 12 completing degree holders for convenience.

5.1.1 Estimating employment probabilities by education

This section outlines the variables and methods used to look at the relationship between education and employment status. The main variable used is whether or not a person is employed. This includes those in wage and salary employment, as well as those who are self-employed. For the Indigenous population, it also includes those in CDEP employment.

While being employed brings a number of benefits, there is also evidence that Indigenous Australians face demand constraints in their ability to obtain full-time employment. For example in 1994 (the most recent data available) 26.5% of female and 28.4% of male Indigenous Australians who were employed less than 35 hours per week said that they would like to work more hours (based on customised calculations from the 1994 NATSIS).[32] For this reason, the relationship between education and the probability of being employed full-time is also estimated.

In addition to increasing one's ability to be employed (full-time or otherwise), education is likely to influence the specific type of employment one is able to obtain. Although certain types of jobs should not necessarily be seen as inherently more valuable than others, it is nonetheless true that certain type of occupations are either more likely to lead to better remuneration or are more desirable for other less tangible reasons (better working conditions or higher status). As such, for those who are employed, the probability of being employed as either a manager, professional or semi-professional is also estimated.

To estimate employment probabilities, the following equation is estimated. Following Halchuk (2006) and Biddle and Webster (2007), who both found a nonlinear effect of age on employment outcomes, a quadratic specification for age is assumed that varies by

[32] While there is no dataset that has figures for both the Indigenous and non-Indigenous population to make direct comparisons, using an alternative data source Burgess, Mitchell and Preston (2003) reported a slightly lower figure for the total Australian population.

education completion. Letting $m_i = 1$ if person *i* is employed and $m_i = 0$ if they are not, the probability of being employed at a given point in time is determined as follows:

$$P(m_i = 1) = f\begin{pmatrix} \alpha_0^m + \alpha_1^m age_i + \alpha_2^m age_i^2 + \alpha_3^m edu_i + \\ \alpha_4^m age_i edu_i + \alpha_5^m age_i^2 edu_i \end{pmatrix} \tag{10}$$

The first term in the equation $\left(\alpha_0^m\right)$ is a constant, α_1^m is the effect that age has on the probability of being employed for the base level of education and α_2^m is the quadratic effect of age. Age is expected to be associated with employment in a number of ways. Firstly, age may affect a person's supply of labour. That is, people of different ages are likely to vary in whether or not they choose to work. Secondly, age could also have an impact on the demand for a person's labour. Under standard human capital theory, experience and therefore age increases one's skills and productivity and therefore increases the desirability of that person to an employer.[33] For those who are or wish to be self-employed, the older one gets, the better able they may be to set up a business.

The constant effect that education has on the probability of being employed is represented by α_3^m, whereas α_4^m and α_5^m are the different linear and quadratic age effects

[33] Given that it is experience rather than age that human capital theory assumes to impact on economic outcomes, research looking at returns to education often use experience in their specification. However, few data sets have a measure for actual experience (which may be prone to recall error anyway) and instead use potential experience. There are two problems with using an estimate of potential experience rather than age. The first is the error with which potential experience is likely to be estimated. For example it does not take into account variation in time spent studying, nor does it take into account variation in employment history caused by, for example, having children. Furthermore, given the Census does not have information on past employment, and there are quite different employment probabilities by sex and Indigenous status, there is likely to be further variation across the different subgroups. While it may be possible to obtain estimates of such information using a cohort style analysis, this would be difficult at the sub-national level, and there is not complete consistency in the education variables between the 1996 and 2001 Censuses (as outlined in Chapter 4). By allowing a separate age effect for each education level and a 'years since completion' term, the probability that for a given age, those with higher education levels are likely to have less experience is taken into account. Chapman and Gray (2006) show that the use of an estimated value for potential experience leads to quite different results in the prediction of labour market outcomes compared to using actual experience (when it is available). Importantly for this thesis though, they show that the coefficient for education is not sensitive to the specification. For robustness, separate estimates using potential experience instead of age and age squared were undertaken. Coefficients changed, however the conclusions based on the summary figures calculated did not.

for those who have completed education.[34] For the two-category education comparison, $edu_i = 1$ if the person has completed Year 12 and $edu_i = 0$ if the person has not. For the five-category education comparison, the base level of education is more narrowly defined as having not completed Year 12 and not having any other qualification, with four separate education variables for the remaining categories. In the five-category education specification, two additional variables for the number of years since either a person obtained a degree $\left(ysd_i\right)$ or other qualification $\left(ysq_i\right)$ are included. The full specification is therefore as follows:

$$P\left(m_i = 1\right) = f\left(\begin{array}{l} \alpha_0^m + \alpha_1^m age_i + \alpha_2^m age_i^2 + \\ \sum_{k=1}^{4}\left(\alpha_{3,k}^m edu_{i,k} + \alpha_{4,k}^m age_i edu_{i,k} + \alpha_{5,k}^m age_i^2 edu_{i,k}\right) + \\ \alpha_6^m ysd_i + \alpha_7^m ysq_i \end{array}\right) \tag{11}$$

The levels of education $\left(k = 1-4\right)$ are defined as follows:

- No Year 12 with qualification $k = 1$
- Year 12 without qualification $k = 2$
- Year 12 with non-degree qualification $k = 3$
- Year 12 with a degree or higher $k = 4$

The likelihood of the event occurring is assumed to be distributed via the probit distribution and the parameters of the model are estimated using Maximum Likelihood Estimation (MLE).

The relationship between education, age and employment status is likely to be quite different depending on a number of other characteristics of the individual. Firstly,

[34] While there are a number of other factors that are likely to be related to employment they are not controlled for in this chapter. This is because the focus of this thesis is both the direct and indirect association between education and employment, so including other variables (a number of which will be associated with education) will hide some of that association. Omitted variable bias would, however, effect the interpretation of these results as the direct association between education and employment.

Indigenous Australians are likely to have a quite different relationship (for a number of reasons as outlined in Chapter 3). Secondly, males and females are likely to have quite different motivations for and constraints on their employment. Finally, the way in which employment is determined is likely to be quite different for those near or past retirement age. This is especially true for the Indigenous population with a life expectancy of 56 years for males and 63 years for females.

For these reasons Equations (10) and (11) are estimated separately for eight groups within Australia. That is, a separate estimate is undertaken for Indigenous and non-Indigenous males and females and, within each of those four groups, those aged under 55 and those aged 55 years and over. As those who are studying full-time are likely to have quite different reasons for being employed, they are excluded from this part of the analysis.

An additional set of estimates is used for the relationship between the same set of explanatory variables outlined in Equations (10) and (11) and the probability of being employed full-time or 35 hours or more per week $\left(P\left(m_i^{ft}=1\right)\right)$. The coefficients for this equation are labelled α^{ft}. For those who are employed, the probability of being employed in a high-status job, defined in this thesis as being a professional, semi-professional or manager is estimated. A similar set of equations as before are set up with $P\left(o_i=1 \mid m_i=1\right)$ being the dependent variable and the coefficients linking education to occupation status labelled α^{o}.

5.1.2 Estimating gross personal income by education

While employment is an important measure of wellbeing, not all types of jobs have the same level of remuneration (see Biddle and Webster 2007 for the distribution of income for the employed Indigenous population). Hence, in looking at the incentives to undertake education, it is also important to look at the income benefits of education. The measure of income used in this section is gross personal (usual weekly) income from all sources. The use of such a measure of income is influenced strongly by data constraints. That is, it is the only variable available on the Census.[35] However, the benefit over other income measures that are often used in research on returns (for example wages and earnings) is that a number of individuals, especially Indigenous Australians, are likely to receive income from non-wage sources. This could be either instead of or in addition to earnings from wage and salary employment. If youth take these potential non-wage earnings into account when deciding whether or not to undertake education, then they should be included when estimating the predicted benefits of education.[36]

To predict income, similar techniques to those presented in the previous section are used. The way in which this income stream is determined is likely to vary depending on a person's employment status, hence estimates are obtained for four groups of people separately (in addition to the eight combinations of Indigenous status, sex and age group mentioned previously). For those individuals who are not studying full-time, three equations are estimated. There is one for those employed $\left(y_i^m\right)$, one for those not employed $\left(y_i^n\right)$ and a third for those employed full-time $\left(y_i^{ft}\right)$. Remembering that employment probabilities were not estimated for those studying full-time, a single equation is used for this group $\left(y_i^{stu}\right)$.[37]

The functional forms for the first three income specifications are similar to Equations (10)and (11). The only difference is that to estimate the coefficients, Ordinary Least Squares (OLS) is used as opposed to MLE of the probit model. That is, the parameters

[35] In the 2001 Census, income is collected across 14 categories. For this part of the analysis, average income from the 2000-01 Survey of Income and Housing Costs within each group is assumed, and income modelled as a continuous variable.

[36] If the focus of this thesis was on the causal effects of education on productivity then a focus on earnings would be more appropriate. However, the focus is on the incentives to undertake education. Hence, if a person is able to receive a relatively high level of income support without undertaking education then there may be less of an incentive to undertake education.

[37] For the two-category breakdown, it is only those at high school who are treated as full-time students.

have a direct effect on income with a one-unit increase in the explanatory variables leading to an increase in predicted income equal to the corresponding coefficient.[38]

The equation for full-time students also includes a set of variables that take into account what type of education the student is studying for $\left(\sum_{s=1}^{3}\alpha_{8,s}^{stu}\right)$. In the five-category breakdown, the three possible options are: high school students; students studying at TAFE or other non-university tertiary institutions; and university students. In the two-category breakdown, this term is left off as there is only one type of student, high school students. Income for these individuals can be either employment income (most likely from a part-time job) or non-employment income (e.g. a scholarship or income support from the government). Unfortunately it is not possible to make this distinction using the Census.

Three sets of estimates are calculated for a person's predicted future income stream for each possible age (15 to 85 years). The first estimate can be thought of as what a student would assume for themselves if they were to be continuously employed until age 54.[39] For these employed individuals, $\hat{y}^{emp}\left(age = a \leq 54\right) = \hat{y}^{m}\left(age = a\right)$. Those aged 55 and over are not assumed to be employed continuously, but rather their income is weighted by the probability of employment. That is:

$$\begin{aligned}\hat{y}^{emp}\left(age = a \geq 55\right) &= \hat{y}^{w}\left(age = a\right) \\ &= \left\{P\left(m = 1 \middle| age = a\right) \times \hat{y}^{m}\left(age = a\right)\right\} \\ &\quad + \left\{P\left(m = 0 \middle| age = a\right) \times \hat{y}^{n}\left(age = a\right)\right\}\end{aligned} \tag{12}$$

The second set of income streams calculated extends this partial employment concept to the 54 years and under population. For this estimation, the income stream is what an

[38] Wage equations are often estimated as either semi-log or double-log models. However, given that there is a large number of full-time students and those not employed who have zero income, such models were not appropriate for the estimations in either this or the following chapter.
[39] These individuals can be employed either full-time or part-time.

individual would predict were they to assume their employment probabilities follow the prediction for the given level of education (which is calculated separately for Indigenous and non-Indigenous males and females). For this group $\hat{y}^{part}\left(age=a\right)=\hat{y}^{w}\left(age=a\right)$.

The final set of income streams estimated is for those employed full-time. Here, income for those aged 54 years and under is $\hat{y}^{fulltime}\left(age=a\leq 54\right)=\hat{y}^{ft}\left(age=a\right)$, whereas for those aged 55 years and over it is $\hat{y}^{fulltime}\left(age=a>54\right)=\hat{y}^{w}\left(age=a\right)$.

5.1.3 Summarising employment and income across a person's life

To interpret the estimated relationship between education and employment or income, it is useful to summarise the results across a person's life. To do this, a number of assumptions need to be made. Firstly, post-compulsory high school education is assumed to begin at 15 years of age. As such, those who do not finish high school are assumed to leave at age 15 (i.e. at age 14 they are studying, at 15 they are not), whereas those who do complete high school are assumed to be finished by age 18 (i.e. at school until age 17 then at 18 they are not). Combining these assumptions with additional assumptions on post-school qualifications, the base cases for the five sub-categories of educational attainment are given below.[40]

- Did not finish high school, no post-school qualifications: Leaves school by age 15.
- Did not finish high school, obtains post-school qualifications: Leaves school by age 15, spends two years full-time obtaining qualifications (first non-student year is at age 17).
- Finished high school, no post-school qualifications: Leaves school by age 18.
- Finished high school, obtains post-school non-degree qualifications: Leaves school by age 18 and spends two years full-time obtaining qualifications (first non-student year is at age 20).

[40] These assumptions on the age at which Indigenous Australians undertake education are varied in Biddle (2006e).

- Finished high school, obtains degree or higher: Leaves school by age 18 and spends four years obtaining qualifications (first non-student year is at age 22).

Once a prediction of income for each age/education combination has been obtained, there are a number of other assumptions that need to be made to obtain a prediction of net income over a person's life cycle. The costs of education are important (direct and otherwise), as is the age at which a person undertakes their education (both when they start and how long the course takes). Furthermore, taxes are taken into account, as is a person's life expectancy. More detail on how this is done is given in the Appendix to this chapter.

The final step in estimating the predicted benefits of education is summing predicted employment and income across a person's life. The first summary measure created is the proportion of a person's non-school life spent working, based on the employment probabilities for each possible age up until 54 years and assuming that the probability of being employed stays roughly constant across the year. That is, for a given education level $(k \in 0,4)$:

$$M\left(edu_k\right) = \frac{\sum_{a=a_m}^{54} P\left(m = 1 \middle| edu = k, age = a\right)}{54 - a_m} \tag{13}$$

The probability of employment is summed from the age at which they finish their studies (a_m) to age 54. So, for example, when comparing the employment path of someone who finishes Year 12 and obtains a degree compared to someone who finishes Year 12 only, this probability would be summed over the 33 years from age 22 to 54. The proportion of a person's life spent employed full-time is also summed $\left(M^{ft}\left(edu_k\right)\right)$ as is the proportion of an employed person's life spent in a high-status occupation $\left(O\left(edu_k\right)\right)$.

The ratios of these summary measures for those who complete a given level of education relative to a counterfactual are then constructed to summarise how that particular level of education is expected to benefit an individual.[41] For the two-level education comparison, those who have completed Year 12 (including those who have gone onto further study) are compared to those who have not. For the five-level education comparison, the following comparisons are undertaken, with the label for the comparisons used in this chapter given in brackets.

- Those who have not completed high school but have a post-school qualification are compared to those who have not completed high school and have no qualification (No Year 12 – other quals to no quals).
- Those who have completed high school but have no post-school qualification are compared to those who have not completed high school and have no qualification (No quals – Year 12 to no Year 12).
- Those who have completed high school and have a non-degree post-school qualification are compared to those who have completed high school but have no post-school qualification (Year 12 – other quals to no quals).
- Those who have completed high school and have a degree are compared to those who have completed high school but have no post-school qualification (Year 12 – degree to no quals).

When individuals make decisions as to whether or not to undertake education they do not necessarily value income earned at different points in time the same. Indeed it is likely that a dollar of income now is worth more than a dollar in a year's time. The amount by which the value placed on income received in the future is lower than at the current point in time is referred to as the discount rate.[42] A summary measure that exploits the concept of a discount rate is the internal rate of return (IRR).

[41] Such calculations can be thought of as the average benefit of education. It is not possible to estimate the benefit of education for the individual on the margin between undertaking education and not undertaking education using the available data.
[42] This should not be confused with inflation, where the amount of goods a dollar worth of currency can purchase falls through time. It would be more accurate to say that with a positive discount rate, a unit of

The IRR is used in this thesis to summarise the predicted income benefits of education.[43] It shows the extent to which a level of education is beneficial in an economic sense when compared to the counterfactual level of education. It is the discount rate which, when applied to the income differential resulting from the additional level of education, calculated at each point in time, results in a net benefit stream of zero. Benefits in this context are likely to be negative when the opportunity and direct costs of education are high (while the education is being carried out), and positive when the extra income resulting from the education outweighs any costs. For more information on the calculation of IRRs, see Ryan (2002).

5.2 Income and employment benefits of education – Results

As mentioned at the start of this chapter, there has been previous research that looked at the predicted economic benefits of education for Indigenous Australians. Before presenting the results from the analysis for this thesis, it is important to summarise this research. This will put the more recent results presented in the remainder of this chapter into historical context.

Coombs (1972) and Altman and Nieuwenhuysen (1979) documented relatively poor employment status for Indigenous Australians and Treadgold (1988) lower incomes. However, Ross (1993) and Miller (1989) were the first to explicitly model the contribution that education made to the employment status of Indigenous Australians. Ross (1993) found that, at the mean, an additional year of schooling increased the probability of an Aboriginal person living in New South Wales being employed by 5.16 points for males, and 5.87 for females. However, Miller (1989) found that even after controlling for school and post-school qualifications, being Indigenous was still associated with a higher probability of being unemployed or not in the labour force.

goods or services (say, a television) is worth more now to a person than it is in a year, and even less in two years.

[43] Where it is not possible to construct an IRR, ratios of lifetime income are used.

Hunter (2004) gives more recent evidence on the association between a person's education level and their employment using the 2001 Census. The author found that the estimated effect on being employed of completing Year 12, as well as Year 10 or Year 11 was relatively high for Indigenous males and females compared to non-Indigenous males or females.

Looking at income, Daly (1995) found that, using the 1991 Census, the predicted effect of education for those employed full-time was generally similar for the Indigenous compared to the non-Indigenous population and that relatively low levels of human capital were a greater explanation for the income gap between the two populations. Using the same data source, Daly and Liu (1995) looked at the private rate of return (in income) for Indigenous Australians for those employed full-time, making comparisons with the non-Indigenous population. The authors found that for post-compulsory schooling, Indigenous males had a lower estimated rate of return than Indigenous females. Furthermore, for both males and females, estimated returns were higher for non-Indigenous compared to Indigenous Australians.

Junankar and Liu (2003) provide estimates using the 1991 Census of the social rate of return to education for Indigenous Australians (that is, taking into account income and expenditure of governments). The authors found a high return to education for Indigenous Australians, larger at certain levels of education than the corresponding non-Indigenous rate of return. Interestingly, the authors explicitly took into account the probability that education leads to lower rates of arrest and find that doing so leads to rates of return that were slightly higher. Junankar and Liu (2003) also note that the rates of return are 'virtually unchanged' when they took into account variation in life expectancy. This is because internal rates of return discount the future quite heavily.

Both Daly (1995) and Daly and Liu (1995) focus on the association with income for those who are employed full-time. This makes sense from the perspective of investing in human capital because in that context a researcher is focussed on the effect education has on a person's productivity. However, when looking at the motivation to go to school, youths are likely to be interested in the income they get from alternative activities to full-time employment. For example, if a person could get a reasonably high income while they are not employed, regardless of their education levels, then there is less motivation to undertake studies. For this reason, income of those employed and not employed is analysed in this thesis.

In summary, the previous literature on the benefits of education has tended to show that education is particularly important for Indigenous Australians in being able to find or wanting to find employment. However, once employed, the effect of education is either similar or lower than the effect for the non-Indigenous population. As noted in Daly (1995, p.49), these results show that the point of entry into the labour force (that is the ability to obtain employment) may be where Indigenous Australians face the greatest discrimination, rather than once employed.

5.2.1 Difference in lifetime employment, full-time employment and occupation by education completion

To begin the presentation of results, the following table presents the predicted employment benefits of education, summarised by the ratios in lifetime employment.

Table 5.2 Ratio of lifetime employment by education completion

	Indigenous		Non-Indigenous	
Type of education	Male	Female	Male	Female
Year 12 to no Year 12	1.36	1.62	1.09	1.27
No Year 12 – other quals to no quals	1.51	1.77	1.21	1.26
No quals – Year 12 to no Year 12	1.44	1.67	1.18	1.25
Year 12 – other quals to no quals	1.19	1.28	1.06	1.12
Year 12 – degree to no quals	1.25	1.45	1.10	1.21

Source: Customised estimations from the 2001 Census. The predicted probabilities that these ratios are based on are given in Appendix Table 5A.1 with coefficient estimates given in Appendix Table 5A.8 to 5A.11.

Looking at the two and five-category education breakdowns, the difference in employment probabilities by education is higher for Indigenous Australians than non-Indigenous Australians and higher for females than males. The employment benefits of education may be particularly high for the Indigenous population because they face quite strong demand constraints.

Of the four education comparisons presented in the second part of Table 5.2, the biggest difference seems to be between those who have other qualifications compared to those who do not for those who did not complete Year 12. In general, those who did not complete Year 12 appear to receive the biggest benefit (in terms of employment) from getting a post-school qualification as opposed to completing Year 12 only. Not surprisingly, for those who did complete Year 12, the difference is greater for those with a degree compared to those with other qualifications.

The following table summarises the predicted full-time employment differences by education.

Table 5.3 Ratio of lifetime full-time employment by education completion

Type of education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Year 12 to no Year 12	1.65	2.24	1.10	1.52
No Year 12 – other quals to no quals	2.14	2.54	1.31	1.33
No quals – Year 12 to no Year 12	1.92	2.40	1.25	1.41
Year 12 – other quals to no quals	1.37	1.37	1.11	1.11
Year 12 – degree to no quals	1.47	1.71	1.17	1.31

Source: Customised estimations from the 2001 Census. The predicted probabilities that these ratios are based on are given in Appendix Table 5A.2 with coefficient estimates given in Appendix Table 5A.12 to 5A.15.

The full-time employment probability differences are generally larger than the employment probability differences presented in the previous table. This is especially the case for Indigenous females who, once again, have the highest predicted differences, followed by Indigenous males. The biggest differences are, once again, for completing other qualifications if a person did not complete Year 12, as well as for Year 12 completion itself.

The final table in Section 5.2.1 summarises the predicted benefits of education as measured by the difference in predicted lifetime employment in a high-status occupation.

Table 5.4 Ratio of lifetime employment in a high-status occupation by education completion

Type of education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Year 12 to no Year 12	2.41	1.94	2.32	2.26
No Year 12 – other quals to no quals	1.68	2.32	1.16	1.69
No quals – Year 12 to no Year 12	1.91	1.98	1.53	1.63
Year 12 – other quals to no quals	1.32	1.76	1.11	1.67
Year 12 – degree to no quals	2.73	2.75	2.01	2.60

Source: Customised estimations from the 2001 Census. The predicted probabilities that these ratios are based on are given in Appendix Table 5A.3 with coefficient estimates given in Appendix Table 5A.16 to 5A.19.

Comparing those who completed Year 12 to those who didn't (the first line of the table) Indigenous males seem to have the biggest difference in the average amount of time spent in a high status occupation. Indeed, across the ages of 18 to 54, the average probability of being in a high status occupation is almost two and a half times higher for Indigenous males who completed Year 12 compared to those who didn't. Although still almost twice as likely on average to be in those occupations, of the four groups studied, high school education appears to have the smallest association for Indigenous females.

For the five group education comparisons, there is a fair bit of variation in the relative effect of different types of education by Indigenous status and sex. Although having a degree has the strongest association for all of the four groups, (ranging from 2.75 times for Indigenous females to 2.01 for non-Indigenous males), the effect of other qualifications is more varied. For example, Indigenous females who did not complete Year 12 but have a qualification are 2.32 times more likely on average to be in a high-status job than the same group with no qualifications. Compared to this, there is only a small difference for non-Indigenous males within the same education comparison.

In general, probably reflecting the difference in the type of employment the sexes are likely to find themselves in, males see relatively small benefits in terms of occupation status from non-degree qualifications, but a fairly large benefit from high school. For females on the other hand, other qualifications appear to have quite an appreciable effect on occupation status.

5.2.2 Difference in lifetime income by education completion

The differences in lifetime income by education, as measured by the IRR, are separated into three sections. The first section looks at the total population, the second section looks at those employed and the final section those employed full-time.

Table 5.5 Internal rates of return by education type

Type of Education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Year 12 to no Year 12	0.24	0.18	0.13	0.14
No Year 12 – other quals to no quals	0.69	0.39	0.38	0.17
No quals – Year 12 to no Year 12	0.26	0.16	0.14	0.12
Year 12 – other quals to no quals	0.28	0.18	0.17	0.11
Year 12 – degree to no quals	0.30	0.30	0.21	0.19
Year 12 to no Year 12 (employed)	0.15	0.16	0.10	0.11
No Year 12 – other quals to no quals (employed)	0.42	0.36	0.21	0.10
No quals – Year 12 to no Year 12 (employed)	0.15	0.16	0.09	0.08
Year 12 – other quals to no quals (employed)	0.18	0.12	0.10	0.07
Year 12 – degree to no quals (employed)	0.21	0.19	0.17	0.15
Year 12 to no Year 12 (employed ft)	0.10	0.11	0.11	0.11
No Year 12 – other quals to no quals (employed ft)	0.23	0.18	0.17	0.08
No quals – Year 12 to no Year 12 (employed ft)	0.09	0.09	0.09	0.07
Year 12 – other quals to no quals (employed ft)	0.12	0.10	0.08	0.07
Year 12 – degree to no quals (employed ft)	0.17	0.15	0.15	0.13

Source: Customised estimations from the 2001 Census. The estimates of total lifetime income that these ratios are based on are given in Table 5A.4 to 5A.6 with coefficient estimates given in Appendix Table 5A.20 to 5A.25.

Looking at the two education comparison, Indigenous males appear to have the highest predicted benefit of completing Year 12. Indigenous males also have the highest estimated IRR for the five-category breakdown. Indeed, for those who did not complete Year 12, the IRR for completing a qualification compared to not is over 0.50. This reflects both the large difference in earnings (weighted by employment probabilities) plus the low opportunity costs of these qualifications. That is, individuals only have to give up earnings for two years and when they do so, they still receive (on average) an income that is not too dissimilar from that which they are otherwise estimated to receive. These high rates of return may be a reason why male Indigenous youth see non-school options as being particularly attractive.

Females are also estimated to experience a high rate of return for this education scenario, although not as high as males. Similarly, for both sexes, Indigenous Australians have a higher estimated IRR. For those who did finish Year 12, however, not only are the estimated IRRs lower, so too are the male/female differences. The differences are smaller still for degrees and Indigenous females have roughly the same IRR as males.

The IRRs presented in the first part of the table are much higher than those reported in similar studies in Australia.[44] For example, Borland (2002) and Johnson and Lloyd (2002) for the benefits of university, Ryan (2003) for estimates of the benefits of vocational education, and Junankar and Liu (2003) for Indigenous-specific results. These authors, however, generally focus on earnings and hence the more comparable results are in the second and third sections of Table 5.5. Not surprisingly, when taking out the association between education and employment, the predicted income benefits of completing education are smaller. Furthermore, the Indigenous and non-Indigenous estimates are much closer to each other.

That the relativities between Indigenous and non-Indigenous Australians (and males and females to a lesser extent) are reduced when focussing only on those who are employed reinforces the fact that it is getting access to employment itself that explains a large part of Indigenous Australian's relatively poor socioeconomic status. This shows that focussing on Indigenous Australians yet restricting the analysis to only those who are employed would understate the potential difference to an individual's future economic paths that education might be expected to bring.

5.3 Variation in the income and employment benefits of high school education within the Indigenous population – Method

The results presented in Sections 5.2 and 5.3 show that there are quite different predicted benefits of education for the Indigenous population compared to the non-Indigenous population. This is especially the case for the relationship between education and employment probabilities. However, as outlined in Chapter 3, there is also likely to be diversity within the Indigenous population in the predicted benefits of education. If other characteristics of the individual influence the predicted effect that education has on either

[44] Separate calculations were also undertaken for those who commenced their education later in life or did so part time. Those Indigenous Australians who do study as mature age students do not have a high enough return to catch non-Indigenous Australians who undertook the same levels of education at a younger age. This suggests a role for supporting Indigenous Australians in not delaying their education for as long as they currently seem to be doing, whilst keeping in mind the potentially valid non-economic reasons for doing so.

the ability to obtain employment or a person's income, then all else being equal, this might also change the economic incentives to undertake education. That is, if Indigenous youth expect themselves to be more likely to be in one subgroup rather than another, then they may be more likely to use information from others in that subgroup to make their predictions of the benefits of education.

Results are presented using the 2002 NATSISS that look at whether an Indigenous youth would predict different employment and income benefits of high school education depending on where he or she gets their information from. As shown in Chapter 4, the NATSISS has a far richer range of social, demographic and employment information than the Census and hence is well suited to analysis of outcomes by socio-economic status. However, because of the smaller sample size and hence relatively small number of people with post-school qualifications, especially degrees, as well as the lack of information on the number of years since a person obtained their qualifications, the focus is on high school education.

One of the benefits of using the NATSISS is that, in a first for large datasets containing Indigenous Australians, the NATSISS contains continuous income data.[45] Previously, analysis of returns to education was based on grouped income data either because that was all that was collected (in Censuses) or because of the way the data was confidentialised (in previous surveys). After excluding individuals who did not state their income, there were 7,460 Indigenous Australians aged 15 to 54 analysed from the NATSISS.

In the remainder of this section, the methods used to look at the variation in the predicted benefits of high school education are given including the subgroups used. The results from the analysis are presented in Section 5.4.

[45] There is some top-coding of income, however Biddle and Hunter (2006c) showed that for personal income, this affects only a small proportion of the population (0.65% of the population). I assume that this group has the lower bound of $1,500 per week).

5.3.1 Subgroups that variation in the predicted benefits of education is estimated for

In the absence of longitudinal data, it is important that the subgroups used are ones which, if an individual is in at the time of making their education decision, they expect to remain there throughout their lives with a reasonable degree of certainty. Alternatively, the subgroups could include those which a person has a fair amount of control over and hence they are able to take this into account when making their education decision.

The subgroup comparisons undertaken in this part of the chapter are outlined below.

Remoteness

Given the view expressed most recently by Johns (2006) that one of the reasons for low educational attendance in remote areas is the particular lack of economic incentives to do so, it is important to see the extent to which the predicted benefits of education do actually vary between remote and non-remote Australia. If there are differences, it is also important to see whether the differences are in the ability to obtain employment, or a person's income once employed. The first subgroup comparison that is made is therefore by remoteness.

If there were no costs to migration and individuals had full information about conditions and individuals in all geographical areas, then returns to education would tend to be equal across geographical area (Dahl 2002). Individuals would move to areas where the remuneration for their level of education was highest and students would move to areas with the lowest cost of education. However, as outlined in Chapter 3, there are economic costs to moving so adjustment may not be instantaneous.

Those in remote Australia are compared to those in non-remote Australia. Remote areas in this section include the remote and very-remote regions from the five category ARIA+

classification. Therefore non-remote includes major cities, inner regional and outer regional Australia.

Community Development and Employment Projects (CDEP) scheme

The CDEP scheme is an alternative form of employment for Indigenous Australians where individuals in the community who would otherwise be unemployed forego unemployment benefits in exchange for wages for work on community-run projects (Morphy and Sanders 2001). Estimates of returns to education for Indigenous Australians have often included those in CDEP employment along with those in non-CDEP employment, mainly because with the data available it was not possible to separate the two. However, because the CDEP scheme is run as an all-in scheme with those communities with a CDEP scheme presence having the majority of those working on the scheme, those potential students in the area are likely to use CDEP workers as their major source of information for calculating the benefits of education.

Individual CDEP schemes are unlikely to place as high a premium on education or other characteristics of the individual as other types of employment. Hence, once employed, the wages of those in the scheme will not vary as much by education. Hunter (2003) also identified the potential adverse effects of the CDEP scheme on human capital formation through it providing an ‘easy’ option for exiting the education system. That is, because a reasonably high-paying job in a CDEP scheme may be available for those who leave school, the opportunity cost of education may be relatively high. Given recent changes to the CDEP scheme have been motivated in part by concern that the CDEP scheme is discouraging students from completing their studies (DEWR 2005), it is important to understand whether there are differences in the predicted benefits of education for those in the CDEP scheme compared to those in other employment and whether these differences remain for those in full-time employment only.

Disability

For those with poor health there may be a high unobserved cost of education (Hollenbeck and Kimmel 2001). Those populations with a high unobserved cost of education will more than likely have education concentrated amongst those with relatively high levels of ability and hence the measured benefits of education will also be relatively high. Alternatively, poor health may affect a person's productivity once in the labour force and those with health problems may not be able to take advantage of the increased earnings capacity from education thereby facing lower returns to education. Given the relatively poor health outcomes documented for Indigenous Australians (for example, in AIHW 2005), it is important to investigate whether this may be having any effect on the incentives to complete high school.

Compared to the two previous subgroup comparisons mentioned, it is less likely that a 15 to 17-year-old will be able to accurately predict what their health status will be throughout their lives. For this reason disability is used as the measure of poor health as unlike more contemporaneous or self assessed measures of health, those health outcomes classified as disabilities are likely to be more long-standing.

English language difficulties

A person's cognitive and non-cognitive ability is likely to strongly influence the benefits of education, as well as the costs. Unfortunately, there are no variables on the 2002 NATSISS (or any large data set) that measure all aspects of ability. The 2002 NATSISS does, however, have a variable for whether or not a person has difficulty communicating with service providers. This can be used as a proxy for one aspect of ability, English literacy.

The major problem with such a variable, especially in a cross-section survey, is that it is likely to be strongly influenced by whether or not a person undertakes education, especially later years of education. That is, one of the benefits of education is the improvement in the ability to communicate with service providers. Even so, there are still a number of individuals who have completed later years of secondary school, including Year 12, that identify difficulties in communicating and hence the comparisons with the predicted benefits of education for this group will give some insight.

Children ever born (for females)

Especially for those attending school, pregnancy or childbirth may be associated with a high physical or social cost of education. In addition, for those females no longer at school with a child, it may be more difficult to maintain full-time employment and hence more difficult to exploit the full benefits of education. Furthermore, as those with children receive a high level of income support regardless of education level, variation in welfare payments may also influence the benefits of education.

More so than the other subgroup comparisons, whether or not a female has a child is likely to be influenced by the choices that she makes. That is, despite the fact that a number of pregnancies are likely to be unplanned, fertility decisions may be made in conjunction with education and employment decisions. Nonetheless, by presenting the predicted benefits by whether or not a female has had children, information can be gained on the incentives to undertake education for those who have made their fertility decisions or have had a decision somehow imposed on them. Furthermore, some insight may be gained into how the fertility decisions are influenced by a person's previous education choices.[46]

The two extremes of having a child by the time a female is 15 or not have a child at all represent only a small proportion of child birth outcomes (see Table 5.13 later in this chapter). Instead, the majority of females are likely to have at least one child, however this child is likely to be born when the mother is at least in her late teens or twenties. For this reason, I estimate separate predicted benefits of completing high school are estimated

[46] Ultimately, a joint model of fertility decisions, employment and education attendance would need to be estimated to disentangle these different relationships.

for different ages of having children. Due to this added complexity, results for this subgroup comparison are given in a separate sub-section.

5.3.2 Method – Model specification and hypothesis tests

To analyse variation in the predicted benefits of high school education, a slightly different specification is used to that outlined in Section 5.1. The first step though, is to obtain a prediction for the outcome of interest by age that is allowed to vary by education completion. Beginning with the specification with the probability of being employed as the dependent variable, the equation linking education to outcomes in this section is given below:

$$P\left(m_i=1\right)=f\left(\begin{array}{l}\gamma_0^m+\gamma_1^m age_i+\gamma_2^m age_i^2+\\ \sum_{k=1}^{2}\left(\gamma_{3,k}^m edu_{i,k}+\gamma_{4,k}^m age_i edu_{i,k}+\gamma_{5,k}^m age_i^2 edu_{i,k}\right)+\\ \gamma_6^m subgroup_i+\sum_{k=1}^{2}\left(\gamma_{7,k}^m edu_{i,k} subgroup_i\right)\end{array}\right) \tag{14}$$

The major difference between Equation (14) and Equation (10) is a set of variables for whether or not the person is in one particular subgroup or another. While this variable is interacted with a person's education levels, there is no separate age distribution by subgroup.

The omitted education category in this new specification is someone who has completed up until Year 9 only. The two other categories are whether someone has completed Year 10 or 11 $(k=1)$ or whether someone has completed Year 12 $(k=2)$. Once again, the parameters of the model are estimated via MLE assuming the probit model.

A similar specification is used to look at the income benefits of education for those employed. This specification is estimated via OLS with the coefficient estimates γ^{ym}. The results presented in this thesis are for those employed only. The results for the total population and those employed full-time are given in Biddle (2006d).[47]

Because a sample survey is being used for this part of the analysis, it is important to test, in a statistical sense, whether being in a particular subgroup is associated with a different relationship between education and the set of economic outcomes. That is, if the vector of coefficients $\gamma_{7,k} \neq 0$ then this is evidence that those in the subgroup have a different association between their education outcomes and their employment probability or income than the base case. It is also possible to test whether the individual Year 10/11 and Year 12 and subgroup interaction terms are significant. That is, whether $\left(\gamma_{7,1} \neq 0\right) \text{or} \left(\gamma_{7,2} \neq 0\right)$.

A separate set of estimates is undertaken for Indigenous males and females as well as for each of the subgroup comparisons. Given all those in the CDEP/non-CDEP subgroup breakdown are already employed, the predicted employment benefits of education for this specification are not estimated.

The following table gives the average value of each of the independent and classification (or subgroup) variables for males and females separately. The two main dependent variables, average income and the proportion of the population employed are given for these variables as well as their alternatives (in italics). The table is restricted to those not currently at high school and uses person-level weights.[48]

[47] Unfortunately there is no occupation information on the 2002 NATSISS which means it was not possible to estimate the predicted benefits of education as measured by occupation status.

[48] I do not use weights in the remainder of the analysis because I control for age and sex in the model (the two main variables which weights are based on) and estimate separately by geography. Furthermore, at the time of estimation, the computing packages available via the RADL did not easily support their incorporation.

Table 5.6 Population proportion, average income and proportion of the population employed – 2002 (aged 15 to 54 and not at high school)

Variable	Population proportion*	Proportion employed	Average (individual) income
Male			
Independent variables			
Age	32.3	n.a.	n.a.
Completed Year 10 or 11	0.43	0.65	407.0
Completed Year 12	0.20	0.74	503.5
Completed Year 9 or less	*0.37*	*0.50*	*307.3*
Classification/subgroup variables			
Remote or Very remote	0.28	0.68	319.6
Non-Remote	*0.72*	*0.58*	*416.1*
Employed as part of CDEP scheme	0.18	n.a.	255.7
Employed but not part of CDEP scheme	*0.43*	n.a.	*647.4*
Has a disability	0.33	0.47	336.8
Does not have a disability	*0.67*	*0.68*	*415.0*
Has English language difficulties	0.12	0.44	260.6
Does not have English language difficulties	*0.88*	*0.64*	*407.4*
Total population	107,997	0.61	389.0
Female			
Independent variables			
Age	32.6	n.a.	n.a.
Completed Year 10 or 11	0.47	0.44	342.9
Completed Year 12	0.20	0.62	467.6
Completed Year 9 or less	*0.33*	*0.28*	*283.4*
Classification/subgroup variables			
Remote or Very remote	0.27	0.49	316.8
Non-Remote	*0.63*	*0.40*	*360.4*
Employed as part of CDEP scheme	0.10	n.a.	310.2
Employed but not part of CDEP scheme	*0.32*	n.a.	*528.1*
Has a disability	0.32	0.32	328.3
Does not have a disability	*0.68*	*0.47*	*358.1*
Has English language difficulties	0.13	0.27	262.6
Does not have English language difficulties	*0.87*	0.45	*361.9*
Has at least one child ever born	0.76	0.39	365.7
Does not have any children ever born	*0.24*	*0.54*	*292.8*
Total population	115,985	0.42	348.5

Note: *In the first column of figures, the value for age represents the average across the population

5.3.4 Method – Summary statistics

Hypothesis tests show whether there is any statistically significant difference in the association between education and employment and/or income by population subgroup. However, a statistically significant difference does not necessarily lead to a large practical effect on the predicted benefits of education. Alternatively, although the relationships between the variables may not be significantly different in a statistical sense, a difference through education of the same magnitude may have different impacts on different subgroups when summed across a person's life depending on the predicted value from which the difference is occurring. Therefore, to quantify the differences in the benefits of education by subgroup status, a set of summary statistics are once again calculated.

The first summary measure is the proportion of that person's non-school life spent working, based on the employment probabilities at each age. These are calculated in the same way as in Equation (13) with a_m set to 18.[49] The summations for each education/subgroup combination are used in two ways. Firstly, for a given education level, the ratio between $M(...)$ for the two subgroup options is calculated. Secondly, comparisons between education levels are calculated where:

- those who completed Year 10/11 are compared to those who completed Year 9 or less;
- those who completed Year 12 are compared to those who completed Year 9 or less; and
- those who completed Year 12 are compared to those who completed Year 10/11.

This is done separately for those in and not in each of the subgroup options. The differences in the ratios reflect the effect being in each subgroup has on the measured employment benefits of high school education.

When calculating summary measures for income, a further set of estimations is carried out on the student population, once again reflecting the fact that undertaking education is associated with economic costs.[50] That is:

[49] A slightly narrower subset of ages is used in the summation as opposed to the estimations (for example, a lower bound of 18 rather than 15) to explicitly exclude those still at school.

[50] I use a similar specification to the one used for the non-student population to maintain consistency. However, an examination of the raw data showed a large increase in income between the age of 15 and 16 for both males and females, an insignificant increase for males between the age of 16 and 17 and a small increase for females between the age of 16 and 17. This mirrors quite closely the predictions from the quadratic specification. I also tried a more flexible specification with a separate shift term for those 16

$$y_i^{stu} = \gamma_0^{stu} + \gamma_1^{stu} age_i + \gamma_2^{stu} age_i^2 + \gamma_6^{stu} subgroup_i + \varepsilon_i \quad (15)$$

The income calculations for students are incorporated with non-students to estimate the lifetime income of a representative individual based on their high school attainment. These are summed only to age 54 because of sample size constraints when estimating beyond that age in the NATSISS, especially by subgroup. The lifetime income path of the education possibilities are calculated as follows.

- Someone who completed Year 9 or less: Predicted income for the applicable non-student is used from ages 15 to 54.
- Someone who completes Year 10/11: Predicted income for students is used for age 15 and non-students from ages 16 to 54.
- Someone who completes Year 12: Predicted income for students is used from ages 15 to 17 and non-students from ages 18 to 54.

Using these representative students, a person's total expected income over their lifetime is calculated. Using these, within each education type, lifetime income by population subgroup is compared. Furthermore the IRR for each level of education is calculated and compared.

5.4 Variation in the income and employment benefits of high school education within the Indigenous population – Results

The coefficient estimates used to calculate the variation in the benefits of education by population subgroup, as well as the p-values for these estimates are given in Appendix Tables 5A.30 to 5A.36. The main results based on these estimates are summarised below, beginning in Section 5.4.1 with a discussion of the hypothesis tests. Sections 5.4.2 and 5.4.3 give the variation in the employment and income benefits of education respectively

---

years old and for those 17 years old. The income predictions only changed slightly, with no noticeable effect on returns or lifetime income ratios (results available upon request).

for the first four subgroup comparisons and Section 5.4.4 gives the results for the variation by whether or not a female has children.

5.4.1 Hypothesis tests

Living in remote or very remote Australia as opposed to a major city, inner regional or outer regional area was generally found to have a significant association with the relationship between education and both income and employment. The CDEP and education interactions for the full-time employment estimates were significant for males. For the income estimates the interactions were generally not significant for males or females. The exception to this was the Year 12 and education interaction for females; however, this was only significant at the 10% level of significance.

For both males and females, whether or not a person reported that they had a disability did not have a significant effect on the association between education and income. Furthermore, for females, it was not possible to reject the null hypothesis for the employment estimates either. For males, on the other hand, the association with education and employment was significantly different for those with a disability than for those without a disability. More specifically, the coefficient for the Year 10 and 11/disability interaction was significant, whereas the coefficient for the Year 12/disability interaction was not.

For both males and females, reporting difficulty with communication was associated with a significantly different relationship between high school education and income. It was also associated with a significantly different association for the probability of being employed for females.

5.4.2 Employment comparisons by and within subgroups

The discussion of the variation in the predicted benefits of education by subgroup begins by looking at the employment benefits. Within each section of the tables, the first set of numbers is the ratio of predicted lifetime employment of those not in the subgroup to those who are in the subgroup within each education grouping. The specification of subgroup and not in the subgroup is given below the table. The next set of numbers gives the three education comparisons for those not in the subgroup and the final set of numbers the education comparisons for those in the subgroup. Males and females are presented in separate parts of the table.

Table 5.7 Lifetime employment ratios by subgroup

	Remote/ non-remote	*No disability/ disability*	*No difficulty/ difficulty*
Males			
By subgroup			
Year 9	0.70	1.72	1.19
Year 10 or 11	0.84	1.20	1.32
Year 12	0.98	1.32	1.16
By education – not in subgroup			
Year 10 or 11 to Year 9	1.53	1.17	1.35
Year 12 to Year 10	1.16	1.11	1.07
Year 12 to Year 9	1.78	1.29	1.44
By education – in subgroup			
Year 10 or 11 to Year 9	1.29	1.67	1.21
Year 12 to Year 10	0.99	1.00	1.22
Year 12 to Year 9	1.28	1.68	1.48
Females			
By subgroup			
Year 9	0.64	1.53	1.30
Year 10 or 11	0.76	1.28	1.25
Year 12	0.94	1.22	1.96
By education – not in subgroup			
Year 10 or 11 to Year 9	1.75	1.38	1.47
Year 12 to Year 10	1.37	1.24	1.28
Year 12 to Year 9	2.40	1.71	1.89
By education – in subgroup			
Year 10 or 11 to Year 9	1.47	1.65	1.53
Year 12 to Year 10	1.12	1.29	0.82
Year 12 to Year 9	1.64	2.14	1.25

Source: Customised calculations from the 2002 NATSISS. The predicted probabilities that these ratios are based on are given in Appendix Table 5A.26 with coefficient estimates given in Appendix Table 5A.30 and 5A.31.

Note: By subgroup refers to those not in the subgroup (non-remote, non-CDEP, no disability, no English language difficulty) divided by those in the subgroup (remote, CDEP, disability, an English language difficulty).

Looking first at the within education comparisons by subgroup, for both males and females, predicted lifetime employment is higher for those without a disability (especially for those who have completed Year 9 or less), higher for those without an English language difficulty and lower for those who live in non-remote Australia.[51] The latter most likely reflects the CDEP effect where those in remote areas (where CDEP schemes are most likely to be found) who would otherwise be unemployed are employed. Full-time employment is, however, estimated to be higher in non-remote areas (apart from for females who have completed Year 10/11).

Moving on to the differences in the predicted benefits of education by population subgroup, the predicted employment benefits of education are lower for those in remote areas compared to those in non-remote areas. This was observed for males and females and for all education comparisons. In general, the predicted employment benefits of education are higher for those with a disability than for those without a disability with the exception being the Year 12 to Year 10 comparison for males. For those males who report a difficulty communicating, the employment benefit of completing Year 10 or 11 is lower than those who do not report a difficulty, but the benefit of completing Year 12 is higher. For females, the reverse is the case with the benefits of Year 10 being higher but Year 12 lower. Indeed, for those females who report a difficulty communicating, predicted lifetime employment is lower for someone who has completed Year 12 compared to someone who has completed Year 10 or 11 only.

5.4.3 Income comparisons by and within subgroups

Table 5.8 presents the predicted income benefits of education for those employed. Males and females are once again presented in separate parts of the table as are income ratios and internal rates of return.

---

[51] Predicted benefits for the total Indigenous population (that is not by subgroup) are given in Biddle (2006d). The patterns and magnitudes are quite similar to the results given in Section 5.2 using the 2001 Census.

Table 5.8 Lifetime income ratios and internal rates of return by subgroup for those employed

	Remote/ non-remote	*CDEP/ non-CDEP*	*Disability/ no disability*	*Difficulty/ no difficulty*
Males				
By subgroup				
Year 9	1.36	2.31	1.09	1.27
Year 10 or 11	1.16	2.20	1.12	1.34
Year 12	1.40	1.99	1.06	1.32
Internal rates of return				
By education – not in subgroup				
Year 10 or 11 to Year 9	0.11	0.07	0.22	0.19
Year 12 to Year 10	0.19	0.03	0.11	0.12
Year 12 to Year 9	0.15	0.05	0.17	0.16
By education – in subgroup				
Year 10 or 11 to Year 9	0.26	0.06	0.18	0.13
Year 12 to Year 10	< 0	0.19	0.19	0.21
Year 12 to Year 9	0.14	0.10	0.18	0.15
Females				
By subgroup				
Year 9	1.24	1.55	1.09	1.18
Year 10 or 11	1.02	1.51	1.03	1.25
Year 12	1.28	1.56	1.07	1.38
Internal rates of return				
By education – not in subgroup				
Year 10 or 11 to Year 9	0.05	0.08	0.15	0.16
Year 12 to Year 10	0.31	0.13	0.23	0.21
Year 12 to Year 9	0.17	0.11	0.19	0.18
By education – in subgroup				
Year 10 or 11 to Year 9	0.27	0.09	0.22	0.10
Year 12 to Year 10	0.08	0.12	0.19	0.13
Year 12 to Year 9	0.16	0.10	0.20	0.11

Source: Customised calculations from the 2002 NATSISS. The estimates of total lifetime income that these results are based on are given in Table 5A.28 with coefficient estimates given in Appendix Table 5A.32 to 5A.35

Note: By subgroup refers to those not in the subgroup (non-remote, non-CDEP, no disability, no English language difficulty) divided by those in the subgroup (remote, CDEP, disability, an English language difficulty).

Beginning once again with the 'by subgroup' comparisons, for males and females, those in non-remote Australia have a higher predicted lifetime income than those in remote Australia across the three education groups, with the difference for those who completed Year 12 particularly high. The ratios of predicted lifetime income for those in non-CDEP employment compared to those in CDEP employment are quite large, especially for males. For example, the predicted lifetime income of those who have completed Year 9 or less and those who have completed Year 10/11 in non-CDEP employment is more than twice as high as the prediction for those in CDEP employment. Predicted lifetime income is slightly higher for those without a disability for both males and females, whereas those without a difficulty in communicating in English have much higher incomes than those who do.

Looking now at the within subgroup comparisons, the predicted income benefits of completing Year 10/11 over Year 9 are higher in remote areas than they are in non-remote areas. This is especially true for females. Compared to both Year 9 and Year 10/11, the predicted income benefits of completing Year 12 are, however, lower in remote areas than non-remote areas. The income benefits of education are similar for those with a disability compared to those without a disability. For males, the predicted benefits of completing Year 12 as opposed to Year 10 or 11 are somewhat higher for those with a disability. For females, the predicted benefits of completing Year 10 or 11 as opposed to Year 9 or less are higher. The predicted income benefits of education are generally higher for those without a difficulty communicating in English.

The internal rates of return are relatively low for both those in CDEP and non-CDEP employment. This may reflect the fact that one of the benefits of education is being able to obtain non-CDEP employment in the first place (as shown via the 'by subgroup' comparison). This notwithstanding, for males the predicted benefit of Year 12 is higher for those in CDEP employment compared to those in non-CDEP employment. For females, the income benefits of education are similar for both types of workers.

5.4.4 Variation in the predicted benefits of education by the age of having one's first child and the number of children

The final set of empirical results in this section looks at variation in the predicted benefits of education by the age at which a female has her first child. Before looking at these results though, the following table gives the proportion of females who have at least one child by age group, as well as the average number of children for those who have had children.

Table 5.9 Proportion of females with at least one child ever born and average number of children ever born – 2002

	Age group					
	15 to 17	18 to 20	21 to 24	25 to 29	30 to 54	15 to 54
Proportion with children	0.083	0.317	0.680	0.807	0.897	0.709
Average number of children (those with at least one child)	1.540	1.300	1.920	2.526	3.451	3.017

Source: Customised data from the 2002 NATSISS

The proportion of 15 to 17-year-olds who, according to the 2002 NATSISS, have had at least one child ever born is reasonably low. By the age of 18 to 20, however, nearly one-third of Indigenous females in the sample have had at least one child and by the ages of 21 to 24, this had increased to over two-thirds.

To estimate the relationship between the age of having children and the predict benefits of education, Equation (14) is modified to allow a separate effect of being in the subgroup (that is having had a child) for each of the age groups given in Table 5.13. These separate effects are also interacted with high school completion as follows (using $P(m_i = 1)$ as the example).

$$P(m_i = 1) = f\left(\begin{array}{l} \gamma_0^{mc} + \gamma_1^{mc} age_i + \gamma_2^{mc} age_i^2 + \\ \sum_{k=1}^{2}\left(\gamma_{3,k}^{mc} edu_{i,k} + \gamma_{4,k}^{mc} age_i edu_{i,k} + \gamma_{5,k}^{mc} age_i^2 edu_{i,k}\right) + \\ \gamma_6^{mc} subgroup_i + \sum_{k=1}^{2}\left(\gamma_{7,k}^{mc} edu_{i,k} subgroup_i\right) + \\ \sum_{c=1}^{4} \gamma_6^{mc} subgroup_i agegroup_i + \sum_{c=1}^{4}\sum_{k=1}^{2}\left(\gamma_{7,k}^{mc} edu_{i,k} subgroup_i agegroup_i\right) \end{array}\right) \qquad (16)$$

After estimating the equations for the two outcomes (probability of being employed and income for those employed), as well as an estimate for the income of full-time students with and without children, the outcomes are then summed across a person’s life for a number of scenarios. The scenarios are for a female who has her first child at 15, 18, 21, 25 and 30. The comparison group is someone who does not have any children.

The following table gives the results for the same education comparisons as in previous tables, as well as the difference in predicted outcomes for those who have children (at each particular age) compared to those that do not. The employment benefits are not calculated for someone who has their first child at 15 as the outcomes are summed from age 18 to 54 only.

Table 5.10 Variation in the predicted benefits of high school education by age at having their first child

	Age at having their first child					
	Aged 15	Aged 18	Aged 21	Aged 25	Aged 30	No children
Employment ratio						
By age of having children						
Year 9	n.a.	0.96	1.01	1.04	1.08	n.a.
Year 10 or 11	n.a.	0.67	0.71	0.75	0.81	n.a.
Year 12	n.a.	0.69	0.75	0.78	0.84	n.a.
By education						
Year 10 or 11 to Year 9	n.a.	1.43	1.43	1.46	1.53	2.03
Year 12 to Year 10	n.a.	1.21	1.24	1.22	1.21	1.18
Year 12 to Year 9	n.a.	1.73	1.77	1.79	1.85	2.39
Income						
By age of having children						
Year 9	1.16	1.17	1.16	1.12	1.10	n.a.
Year 10 or 11	1.02	1.01	1.01	1.00	1.00	n.a.
Year 12	0.86	0.85	0.84	0.86	0.88	n.a.
By education						
IRR						
Year 10 or 11 to Year 9	0.32	0.16	0.16	0.21	0.23	0.24
Year 12 to Year 10	*	0.17	0.15	0.24	0.26	0.28
Year 12 to Year 9	1.32	0.17	0.15	0.23	0.25	0.26

Source: Customised calculations from the 2002 NATSISS. The employment probabilities and estimates of total lifetime income that these results are based on are given in Table 5A.27 and 5A.29 with coefficient estimates given in Appendix Table 5A.36

Note: * Unable to calculate an IRR as there was not estimated to be an opportunity cost of education.

Beginning with the employment ratios, those females who have children are estimated to spend less time employed between the age of 18 and 54 than those who have no children. An interesting exception to this is those who complete up until Year 9 only and have their first child when they are aged 21 years and over.

The predicted employment benefits of completing high school education are also generally lower for those who have children, apart from the Year 12 to Year 10 comparison which is about the same. This is more than likely because those who have children have other constraints on obtaining employment (including the possibility of relatively high effective marginal tax rates). These supply side constraints reduce the effectiveness of education on reducing demand constraints.

Those who have completed up until Year 11 only have higher lifetime income if they have children compared to if they do not. This is probably because of the relatively high transfer payment for these groups. Those with children who have completed Year 12, however, have lower predicted lifetime income than those who do not have children. This may be because, for those who have completed Year 12, the ability to find a job that pays well above the income support they are entitled to with children means that the disincentives to work do not outweigh the extra time available to work that those without children may have.

The predicted income benefits of high school are also higher for those who do not have children compared to those that do. Furthermore, there is substantial difference between the estimate for someone who has their children at age 30 compared to 15 as those who have children at age 30 are predicted to have almost the same IRR as someone who has no children. This is because the IRR calculations weight the opportunity costs of education and years immediately after completion much higher than later years.

5.5 Summary – Capabilities and the health benefits of education

At the start of this chapter, the analysis of the benefits of education was motivated by the potential role of economic incentives to influence education participation. It was stated that this will not only test one potential reason for low participation, but will also give some insight into what scope there is for increased participation in education leading to a reduction in socio-economic disadvantage.

The difference in lifetime employment by education was generally higher for the Indigenous population compared to the non-Indigenous population. This was true for both high school education and post school qualifications. Partly because of this, for the total respective populations, the difference in lifetime income by education was also generally higher for the Indigenous compared to the non-Indigenous population. Therefore, the results presented already in this chapter would tend to suggest that there is a strong role for increased education participation reducing Indigenous disadvantage.

When focussing on those who are employed and especially those who are employed full-time, the difference in lifetime income by education is similar for the Indigenous population compared to the non-Indigenous population. For some education comparisons, the benefits of education are even less. Because of this, any conclusions on whether the relative benefits of education for the Indigenous population are contributing to low participation are best left until after Chapter 7 when the relationship between different types of benefits and participation are tested. This notwithstanding, the results presented in this chapter suggest that at the margin, increasing Indigenous education would lead to substantial improvements in relative employment and income.

While the benefits of education are reasonably high at the national level for the Indigenous population, this hides a fair degree of variation by population subgroup. For most subgroups, the benefits of education are still positive so this does not take anything away from the role of education in reducing disadvantage; however, what it does show is potential variation in economics incentives to complete later years of secondary school (if individuals rely more heavily on information from those who have similar characteristics to themselves).

Those in remote and very remote areas have lower employment benefits of high school education compared to those in non-remote areas; however, they have similar or slightly higher income benefits. Those with a disability have consistently high employment benefits of high school education compared to those without a disability showing potential unobserved costs of education for this group. On the other hand, those with a difficulty in communicating in English have lower (or similar) benefits of high school showing that English language ability may reduce the costs or increase the benefits of education.

Interestingly, those who are employed in the CDEP scheme have a similar or higher (in the case of Year 12 education for males) predicted income benefit of high school education. This may be because those who have completed Year 12 are able to obtain additional income to that from the CDEP scheme more easily than those with lower benefits of education. Finally, those females who have children, and especially those who have children at a young age, have lower employment and income benefits of completing later years of schooling. As a mother's education is likely to impact on that of her children, these low incentives may be contributing to inter-generational transmission of poor education outcomes.

5.5.1 The effect of education on capabilities

Focussing entirely on the individual income and employment benefits as the motivation for increasing participation in education may underplay the importance of education as a goal for Indigenous public policy. Furthermore, from an individual perspective, employment and income may be only one of many aspects of the motivation to attend and complete high school and other qualifications. A broader analysis of the role of education might take into account the potential effect education has on capabilities (Saito 2003). The concept of capabilities, as developed by Amartya Sen, refers to a person's ability to 'lead the kind of lives they value – and have reason to value' (Sen 1999 p.18). The ability to obtain employment and an adequate income is one aspect of a person's capabilities, however the concept is much broader. Capabilities (or the related concepts of freedom, agency or autonomy) refer to a person's ability to not only direct their lives in the way they would like, but also identify what direction is best for them and choose the actions that are required to get them there.

Under the capabilities approach, education is important in and of itself through 'reading, communicating, arguing, in being able to choose in a more informed way, in being taken more seriously by others' (Sen 1999, p.294). Saito (2003) also identifies the role of education in developing capabilities. This may be in terms of obtaining employment or earning an income as already examined in this chapter; however, there are many other aspects of people's lives that going to school might improve. Perhaps as importantly, education can help in developing 'judgement in the relation to the appropriate exercise of capacities' (Saito 2003, p.17) or in other words, knowing what is the best course of action to take.

Whether or not to engage in criminal behaviour is a useful example of the potential benefits education has on capabilities. Almost anyone is physically capable of committing a crime if they so desired. However, people are likely to choose not to do so because of an assessment that the risk of being caught is not worth the potential reward or because they value leading a life that not does involve criminal activity. Education is likely to improve the ability to identify an alternate path to engaging in criminal activity, expand the range of alternate paths and enhance one's ability to follow a particular path.

Indigenous Australians are more likely to be arrested and appear in court on criminal charges and, for those that do so, have a much higher rate of imprisonment than the non-Indigenous population (Baker 2001). There are a number of factors associated with whether or not an Indigenous Australian has been charged or imprisoned. However, even after controlling for a number of these Weatherburn, Snowball and Hunter (2006) find that those who had completed Year 12 were significantly less likely to have been charged or imprisoned than someone who had not completed Year 12.

The remainder of this section considers another example of how education can improve one's capabilities (either directly or indirectly) by looking at the association between health and education.

5.5.2 The association between health and education

In Chapter 3 a number of reasons were given for why there might be a positive relationship between education and health. The effect health has on education participation is likely to be quite important (Zubrick et al. 2006). Furthermore, the possibility that the correlation between the two outcomes is because of a third variable can not be discounted. However, at least some of the association is likely to be because of the direct and indirect effects education has on health. If this is the case, then individuals may take this into account when making their decisions. If so, then quantifying the relationship between education and health may give additional insight into variation in education participation. At the very least, identifying the extent to which poor health varies across the education distribution for Indigenous Australians will help target health related interventions.

The effect of education on health also fits well with the concept of capabilities. Indeed, Sen (1999) uses the relatively low income but high life expectancy state of Kerala in south-west India as an example of how education and capabilities extends beyond access to resources. The knowledge of the type of behaviour that is beneficial to one's health (or the health of one's children) as well as the ability and confidence to put that knowledge into action are both examples of where education can improve a person's capabilities.

A number of authors have found empirical support for a relationship between education and health. Quantifying the direct effect of education on health, Lleras-Muney (2005) found that an additional year of education lowers the probability of dying in the next ten years by at least 3.6%. Gilleskie and Harrison (1998) found similar results in terms of morbidity and, using self-assessed health as the variable of interest, Kennedy (2002) also found an association between education and health that was similar in Australia and Canada.

There has also been research looking at the association between health and education (either explicitly or along with other variables) that focus on subgroups within the population. Looking at differences between African Americans and whites in the USA, Crimmins and Saito (2001) found differences in healthy life expectancy for both population subgroups. Interestingly, Crimmins and Saito (2001, p.1637) also reported that 'at lower levels of education, the differences in healthy life expectancy between

African Americans and whites are greater than at higher education levels.' This implies that education may affect health differently for different groups of people.

Indigenous Australians have substantially poorer health outcomes than the rest of the Australian population. For example, AIHW (2005) showed that life expectancy at birth is much lower. There are similarly poor health outcomes for Indigenous Australians found across other measures of health. For example, after adjusting for differences in age structure, almost twice as many Indigenous Australians reported their health as either fair or poor as opposed to good, very good or excellent than the non-Indigenous population (33% compared to 18% in ABS 2004a). AIHW (2005) also outlined a number of conditions for which Indigenous Australians suffer disproportionately from. These include circulatory system diseases, diabetes, chronic kidney disease, cancer, respiratory diseases, communicable diseases, injury and poisoning, vision and hearing problems, oral health and mental health (including suicide).

5.5.3 The association between health and education for the Indigenous population

Despite there being a large amount of statistical research looking at the health disparities between Indigenous and non-Indigenous Australians, there is relatively little looking explicitly at the relationship between education and health for the Indigenous population of Australia (AIHW 2005). Although not looking at education and one's own health, Gray and Boughton (2001) provide some evidence of there being a link between a mother's education and the actions that they took with regards to their child's health. Rather than finding a linear relationship between education and children's health service usage, however, the authors find a U-shaped relationship where those with the highest education levels and those with the lowest education levels are most likely to report their children having taken a health action.

There is less research looking at adult health. AIHW (2005) report that those who have higher levels of secondary schooling are more likely to have excellent/very good self-assessed health, less likely to have a disability or long-term condition and less likely to be a current smoker or have high-risk alcohol consumption. Although the paper does not focus on the link between education and health, Booth and Carroll (2005) look at the socio-economic determinants of health for Indigenous Australians and used education as one of the explanatory variables. They find that, in addition to income and employment having an association with self-assessed health, those with low levels of education report statistically significantly lower levels of self-assessed health. However, even after controlling for the effect of the socio-economic controls, an Indigenous person's health is lower than a comparable non-Indigenous Australian.

Biddle (2006b) looked at the relationship between education and health for Indigenous and non-Indigenous Australians aged 20 to 64 years old using data from the 2001 National Health Survey (NHS).[52] In that paper, the relationship between a person's high school completion and the probability of having one of a set of poor health outcomes or health behaviours was examined. The health outcomes were whether a person:

- assesses their own health as being either fair or poor (as opposed to good, very good or excellent); and
- reports one from a number of chronic conditions.

The health behaviour variables were whether a person:

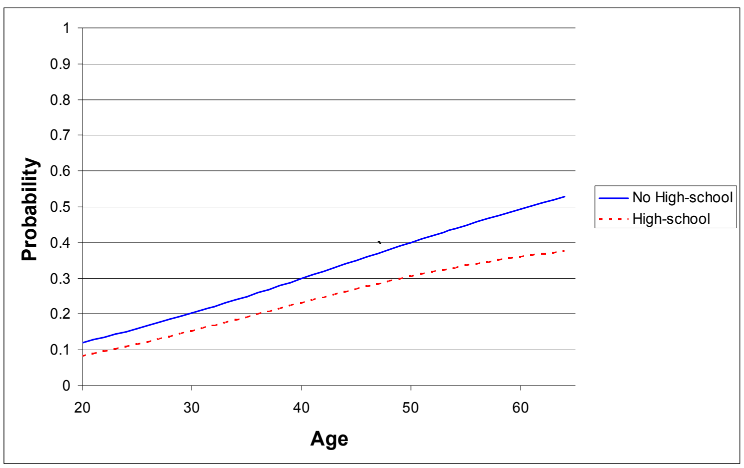
- has a self-identified alcohol consumption classified as risky;
- has a self-reported height and weight that puts their body mass index outside the healthy range;
- has self-identified exercise levels classified as low;
- ever was a smoker; and
- currently is a smoker.

[52] After exclusions, the resulting sample contained 13,991 Australians between the ages of 20 and 64 of which 1,123 identified as being Indigenous.

The remainder of this section summarises the results from Biddle (2006b).[53] The following set of graphs looks at how the health outcomes vary by education status. Indigenous and non-Indigenous Australians are presented separately, and for each of these groups, a separate line is plotted for those who completed high school (the broken red line) and those who did not (the unbroken blue line). The first figure plots the probability of reporting fair/poor health for Indigenous Australians, the second figure non-Indigenous Australians.

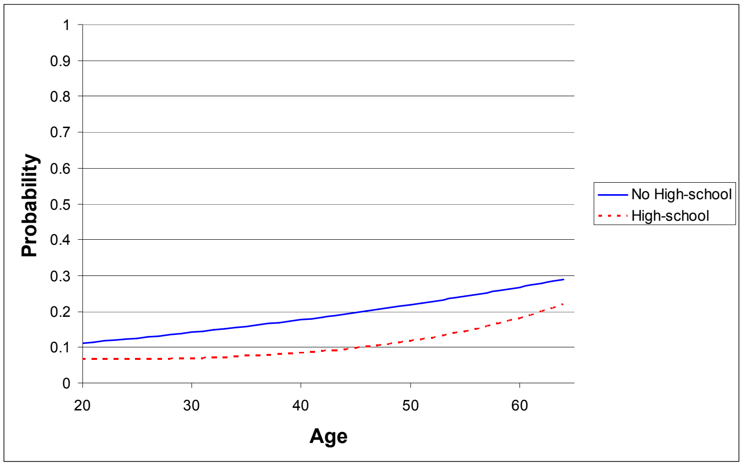
Figure 5.1 Probability of having fair/poor health by education status

5.1a Indigenous Australians



[53] Without controlling for education, Indigenous Australians were more likely to report that their health is either fair or poor than the non-Indigenous population and this difference increases with age. The patterns for the other health variables are also reasonably consistent, although for some age groups and variables (the very old and very young for alcohol consumption and the very young for low exercise) Indigenous Australians have similar and occasionally lower probabilities. For all the health outcomes, there is statistically significant variation by age and Indigenous status.

5.1b Non-Indigenous Australians



Source: Biddle (2006b) using customised estimations from the 2001 NHS

The above graph shows that for non-Indigenous Australians, those who did not complete high school were more likely to report their health as being either fair or poor. This does not seem to vary that much by the person's age. Like non-Indigenous Australians, the Indigenous population who has completed high school is less likely to report fair/poor health than those who did not. However, for the Indigenous population, the difference appears to increase slightly with age.

The results for the other health measures are more mixed.[54] Reporting a chronic condition, risky alcohol consumption and an unhealthy weight did not show substantial variation by education. There was a significant difference, but the magnitude of the differences were quite small. For the chronic conditions estimates, this may be because those with high levels of education are more aware of the conditions that they do have. For the other two variables, the fact that those with unhealthy alcohol consumption and an unhealthy weight were just as likely to have completed Year 12 shows that health knowledge may be less of an issue compared to lifestyle effects.

Having low exercise levels appears to be the health behaviour variable with the highest and most consistent difference between the high school and non-high school populations.

[54] The results are presented in the form of model estimates in Tables 5A.36 and 5A.37 in Appendix 5, with figures based on these model estimates given in Biddle (2005).

For the non-Indigenous population at least, those who didn't complete high school were estimated to be more than one-and-a-half times more likely to report low exercise levels for all ages within the range.

Given the similarities in the patterns between the current smoker and ever was a smoker variables (which is an interesting although not unsurprising finding in and of itself) these variables will be discussed together. For the non-Indigenous population, the biggest difference between those who finished high school and those who didn't finish high school was at the younger age groups. Indeed, up until age 29, those non-Indigenous Australians who did not finish high school were estimated to be more than two times more likely to be current smokers than those who did. This difference decreases with age, although even for those at the upper age bounds, the difference is still substantial. The estimated patterns for Indigenous Australians were slightly different. Here, differences by education also decrease with age, although only up until age 38 (where those who did not finish high school are only 1.09 times more likely to be a current smoker). After that age, the differences by education widen again such that those who completed high school were estimated to have a probability below 10% of currently being a smoker for those aged 54 and 55.

Biddle (2006b) therefore showed that Indigenous Australians with higher levels of education were much less likely to report a range of outcomes and behaviours related to poor health. These results show the potential to target health interventions to those with low levels of education, especially with regards to exercise levels and tobacco consumption. While it is not possible to separate causality with the available data, and there are a number of plausible causal relations outlined in Chapter 3, the results also support a capabilities approach to improving Indigenous outcomes where investments in education and health are mutually reinforcing.

Chapter 6 Variation in the predicted benefits of education by geography

Indigenous Australians benefit substantially from education. This was shown in the previous chapter through the employment, income and health benefits of completing Year 12 which were comparable or higher for the Indigenous compared to the non-Indigenous population. According to standard human capital theory, Indigenous youth and their families should recognise that there are large returns and react positively to the incentives to complete high school and other education. However, at the time of the 2001 Census high school participation rates of Indigenous Australians were well below those of the non-Indigenous population and have continued to be so since (ABS 2006a). One reason why Indigenous Australians might not be responding to the benefits of education presented in the previous chapter is that the national rates may be masking substantial variation by geography.

Wilson, Wolfe and Haveman (2005) found a positive association between the returns to education estimated from 19 to 32-year-olds in the area and high school completion of those in the area. That is, there is empirical evidence that potential students in the USA respond to information from those around them when making their education decision. This chapter looks at variation in the predicted benefits of education by geography in Australia and the extent to which certain characteristics of the area are associated with this variation. Identifying whether there is variation in the predicted benefits of education by geography will give insight into why Indigenous Australians are not responding to the economic incentives at the national level. Furthermore, knowing what areas or what types of areas have relatively low predicted benefits may allow other interventions to be targeted to where they are most needed.

The previous chapter showed variation in the predicted benefits of education between those in remote and very remote Australia compared to the rest of the population using the 2002 NATSISS. However, this is quite a broad level of geography and there is just as likely to be variation within these classifications. Furthermore, ARIA+ does not represent contiguous geographical areas but rather a grouping of areas with similar characteristics. If potential students get information from those around them rather than from people in similar types of areas, then an analysis by much smaller regions is warranted. All the results in this chapter are based on the 2001 Census. This dataset allows robust estimates of the predicted benefits of education by quite small geographical areas for the Indigenous and non-Indigenous populations separately.

Chapter 3 outlined a number of reasons why the predicted economic benefits of education are likely to vary by geography. Firstly, local resource endowments may vary leading to differences in the relative demand for skilled and unskilled labour. This is likely to occur alongside variation in government employment programs at the local level, in particular the CDEP scheme. In addition to labour demand, the relative supply of skilled and unskilled labour may also vary by geography. Those areas with relatively few people with high levels of education may, all else being equal, have a premium on the wages for those who have completed Year 12. In addition, there are likely to be other characteristics of those that have and have not completed Year 12 in the area that affect the predicted benefits of doing so.

If there were no costs to migration then the predicted benefits of education would tend to be equal across areas. However, there are social and economic costs, especially for the Indigenous population who appear to be less likely to move areas within Australia as a result of economic characteristics of the area (as shown in Biddle and Hunter 2006a). These costs to migration are likely to mean that benefits of education do not even out across in Australia in the short or medium term.

Aside from the actual variation in returns, the information that potential students have available to them may also vary by geography. Although potential students are likely to form their expectations with some degree of information, that information may be limited or incomplete (Dominitz and Manski 1996). That is, if students across Australia either utilise or have access to different types of information, then their predictions for their future income and employment outcomes may differ.

Streufert (2000) assumes that individuals get their information only from others who live in their neighbourhood. If there are a number of people with relatively high education levels and high income, alongside individuals with low education levels and low income, then the potential student in that neighbourhood will be able to make an accurate prediction. If, however, there are few people with high incomes and high education levels, then that link may not be apparent. Smith and Powell (1990) and Rouse (2004) found variation by geography in student's predictions about future income that supports Streufert's (2000) prediction. Even if those around them are not the only source of information, if a potential student puts more weight on information from those in their area, predicted benefits estimated separately by area will explain at least some of the variation in incentives to undertake education.

The remainder of this chapter is structured as follows. It begins in Section 6.1 by looking at variation in the predicted benefits of high school and post-school education by the five-category remoteness classification. Section 6.2 outlines the method to look at the method to examine variation by a much smaller level of geography, based on the SLA. The following section presents the distribution of the predicted benefits of education by this geography. One of the benefits of using such small areas is that one is able to estimate what area-level factors are associated with variation in the predicted benefits. The final section of this chapter outlines the results from such an analysis.

6.1 Income and employment benefits of education – Variation by remoteness

The first set of results presented in this chapter is the predicted benefits of education by remoteness. These estimates will show whether the national-level results presented in Chapter 5 are relevant for all Indigenous Australians or whether there are certain areas where the predicted benefits of education are relatively high or low. To estimate variation in the predicted benefits of education by remoteness, the same specifications outlined in

Section 5.1 of the previous chapter are used. However, the coefficients are estimated separately by the five-category remoteness classification.

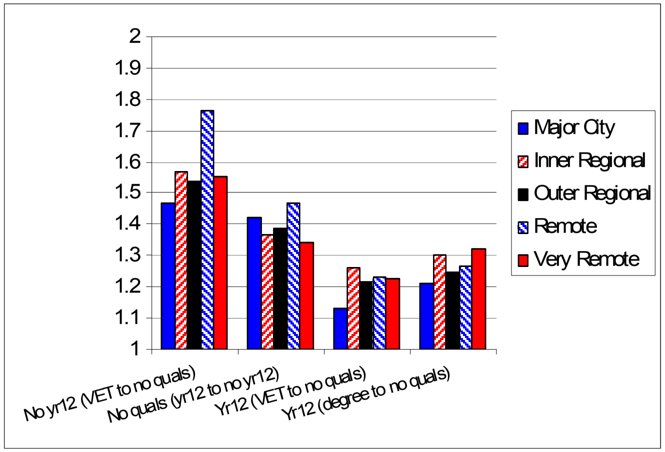
The results are presented in graphical form with actual values given in Appendix 6. There are four sections within each figure representing the four education comparisons outlined in Section 5.1 (where 'VET' is used as shorthand for vocational education and training or non-degree qualifications). Within each section there is a separate bar for each of the five remoteness classifications. Indigenous and non-Indigenous males and females are once again estimated and presented separately.[55]

The first set of results presented in this section is the predicted employment benefits of education by remoteness classification. Like the results presented in Table 5.2, the figures represent the number of years that the person is estimated to be employed up until age 54 if they complete either Year 12 or qualifications divided by the number of years employed for the alternate level of education.

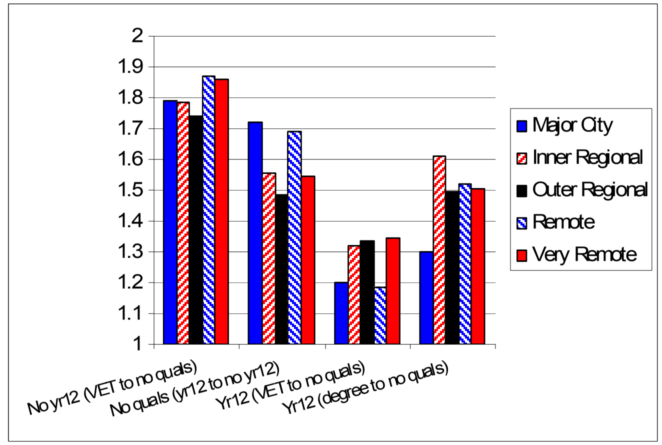
[55] A different scale is used for each of the outcomes. However, within each outcome the same scale is used for all four population subgroups (Indigenous and non-Indigenous males and females) and all four education comparisons.

Figure 6.1 Predicted employment benefits of education by remoteness classification

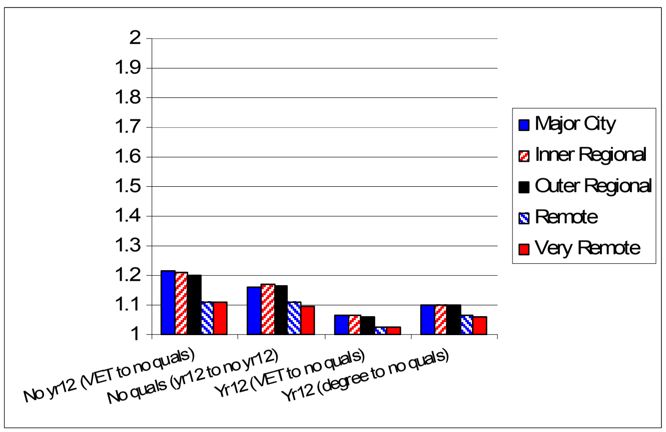
6.1a Indigenous males



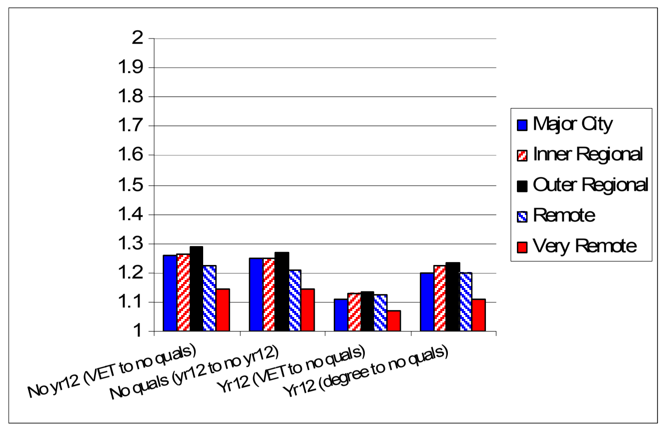
6.1b Indigenous females



6.1c Non-Indigenous males



6.1d Non-Indigenous females



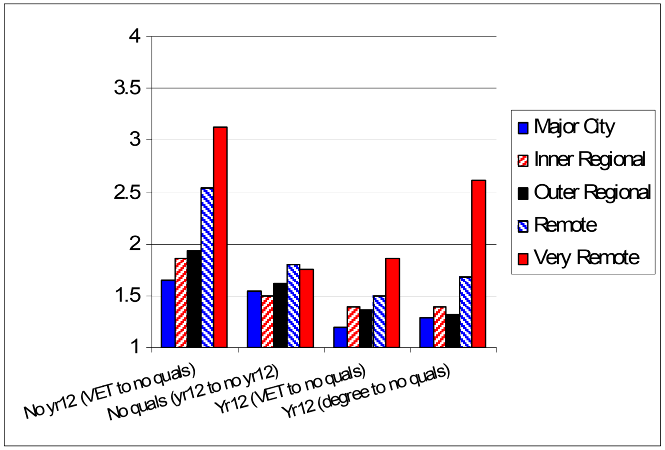
Source: Customised results from the 2001 Census with tabulated results given in Appendix Table 6A.1 and the estimates of lifetime employment that they are based on given in Table 6A.2

For Indigenous males and females, apart from the predicted benefit of completing Year 12 for those without qualifications, those in major cities would generally predict the lowest differences in employment outcomes by education completion. There is also a high predicted employment benefit of completing qualifications for those in remote areas who have not completed Year 12. For non-Indigenous males and females there is a much more consistent pattern across the remoteness categories. Those in major cities and both of the regional areas have similar predictions of the employment benefits of education. Those in remote and very remote areas have lower predicted benefits and for females it appears that those in very remote areas have slightly lower predictions than those in remote areas.

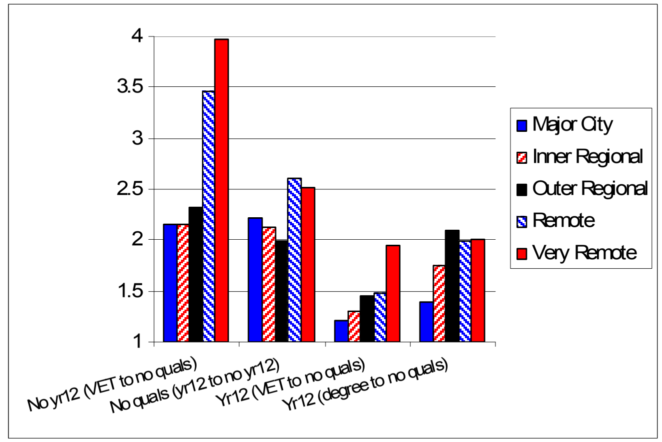
The next set of results presents the predicted full-time employment benefits of education. There are two main reasons for presenting these results in addition to the standard employment benefits of education. Firstly, results in Chapter 2 showed that those who work full-time earn substantially more than those who work part-time. Secondly, part-time employment is made up by a high proportion of people in the CDEP scheme, especially in remote and very remote Australia. Hence these results will give insight into the predicted benefit of education in terms of obtaining non-CDEP employment. The results represent the ratio of lifetime full-time employment between one level of education completion and another.

Figure 6.2 Predicted full-time employment benefits of education by remoteness classification

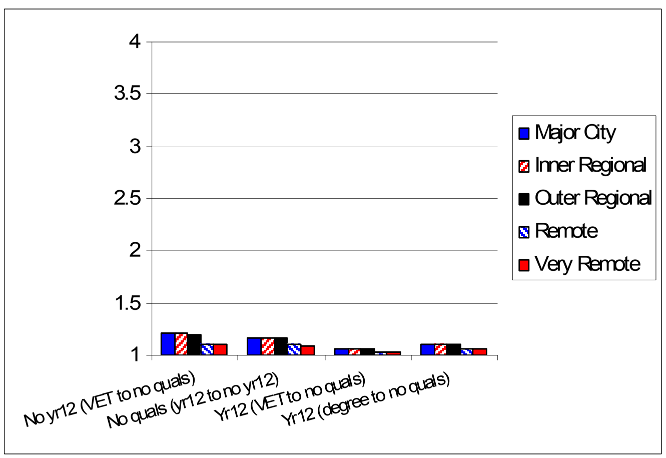
6.2a Indigenous males



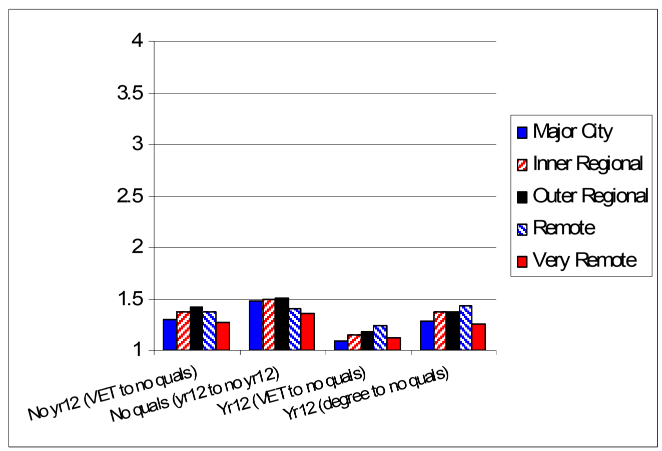
6.2b Indigenous females



6.2c Non-Indigenous males



6.2d Non-Indigenous females



Source: Customised results from the 2001 Census with tabulated results given in Appendix Table 6A.3 and the estimates of lifetime full-time employment that they are based on given in Table 6A.4

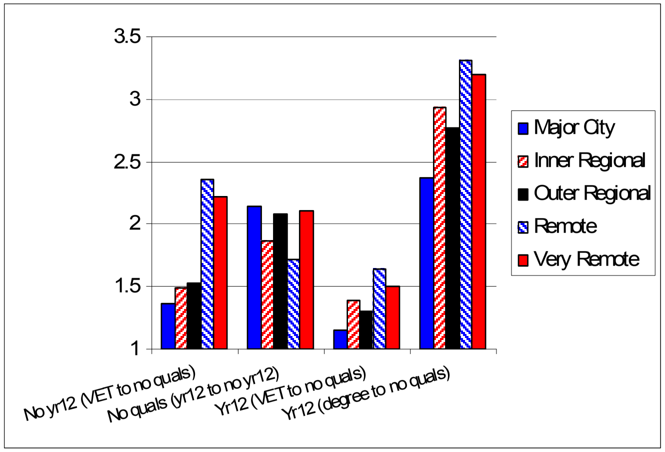
The predicted full-time benefits of education increase quite substantially by remoteness for the Indigenous population. Those in very remote Australia have much higher predicted benefits of education than those in major cities and regional areas, with those in remote Australia also having generally large predicted benefits. This is perhaps not surprising seeing as the CDEP scheme is highly concentrated in remote and very remote areas.

For non-Indigenous males, the benefits are not only smaller, but the patterns move in the opposite direction by remoteness. Those in major cities have slightly higher predicted benefits, with those in remote and very remote Australia having lower predictions in general. For non-Indigenous females, there is more variation in the patterns by remoteness depending on the education comparisons.

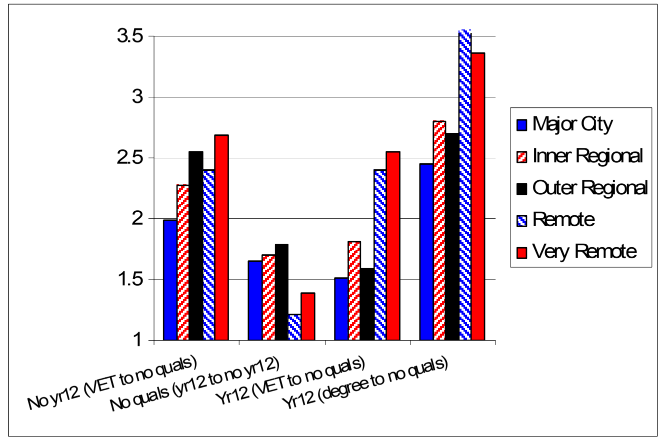
The next set of results looks at the predicted difference in the lifetime probability of being employed as a manager, professional or semi-professional by education. Such jobs represent a cluster of characteristics including income, other remuneration and employment conditions. Looking at those who are employed, the figures represent the ratio of the lifetime occupation probabilities for one level of education compared to another.

Figure 6.3 Predicted occupation benefits of education by remoteness classification

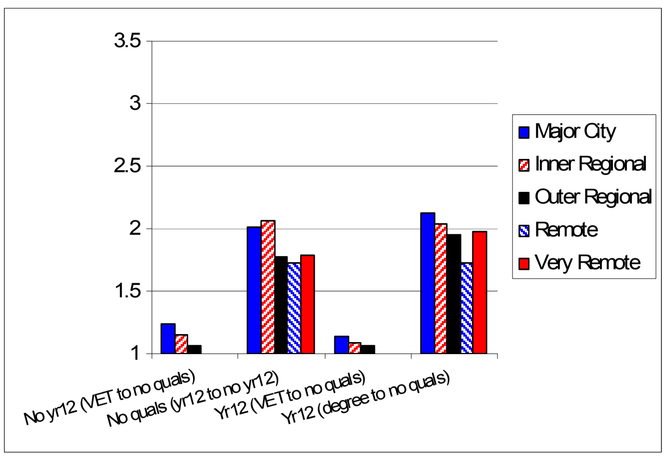
6.3a Indigenous males



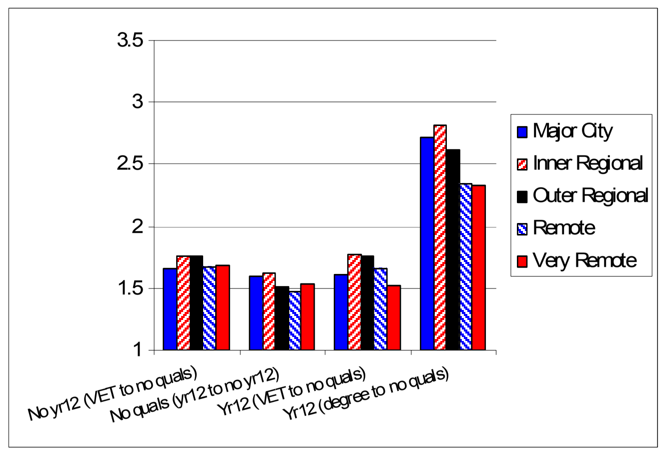
6.3b Indigenous females



6.3c Non-Indigenous males



6.3d Non-Indigenous females



Source: Customised results from the 2001 Census with tabulated results given in Appendix Table 6A.5 and the estimates of lifetime employment that they are based on given in Table 6A.6

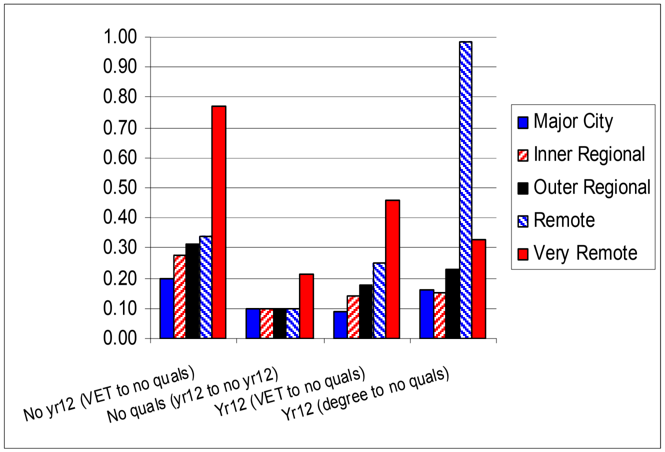
For Indigenous males, post-school qualifications appear to have the biggest association with the probability of being in a high-status occupation in remote and very remote areas. This is also true for Indigenous females; however, for those who have not completed Year 12, the predicted benefits of a non-school qualification are also relatively high in outer regional areas.

Looking at non-Indigenous Australians and non-Indigenous males in particular, the situation is quite different. For this group, education or more particularly non-degree qualifications have little or no association with the probability of being in a high-status occupation in remote or very remote areas. For these groups, the ratio of occupation probabilities for those who have a non-degree qualification is actually less than one (for those who completed Year 12 and those who did not).

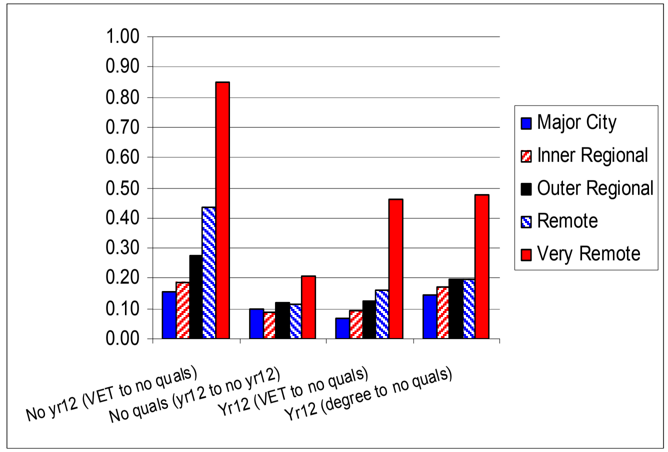
The next set of figures gives the IRRs by remoteness for those employed.

Figure 6.4 Predicted income benefits of education for those employed by remoteness classification

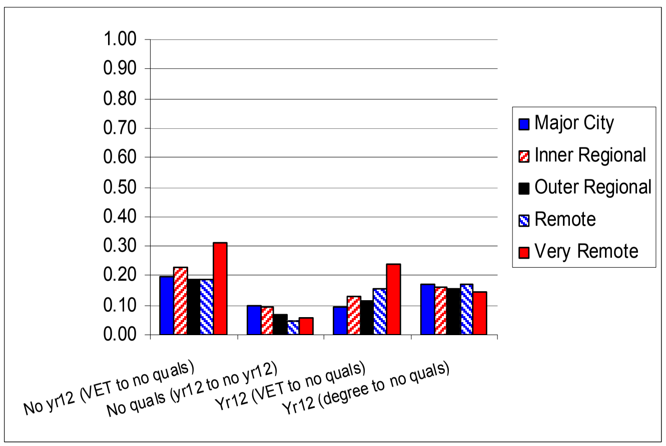
6.4a Indigenous males



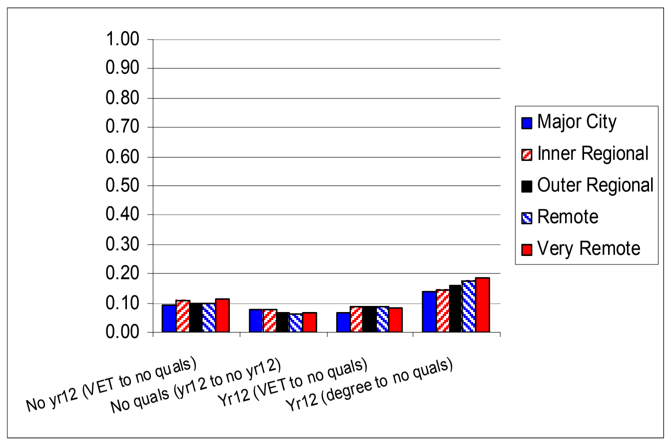
6.4b Indigenous females



6.4c Non-Indigenous males



6.4d Non-Indigenous females



Source: Customised results from the 2001 Census with tabulated results given in Appendix Table 6A.7 and the estimates of lifetime income that they are based on given in Table 6A.8.

For the Indigenous population, the estimated IRRs to completing qualifications are quite high in very remote areas. This is more than likely because there are so few people in these areas with qualifications that those who do have qualifications are able to earn quite high premiums. IRRs in remote areas are also quite high, as are those in outer regional areas. The predicted income benefit of completing Year 12 was relatively high in very remote areas but relatively low in remote areas. For the non-Indigenous population, the predicted benefits of non-degree qualifications are quite high in very remote areas. However, for those with degrees, the IRR is highest in major cities for non-Indigenous males.

In summary, there is substantial variation in the predicted benefits of education by remoteness. For the Indigenous population, although there is some variation in the employment benefits of education, the full-time employment benefits, occupation benefits and income benefits of education are generally higher in remote and very remote Australia.

There are two potential reasons for this. Firstly, because of the relatively low supply of skilled workers in these areas, those who have completed Year 12 or who have qualifications may have a relatively high premium on their wages or may be highly sought after for full-time employment. The second, complementary explanation is that because of high transport and social costs of education in remote and very remote areas, those who do complete education may be at the high end of the ability distribution. The remainder of this chapter looks at additional reasons for variation in the predicted benefits of education.

6.2 Factors associated with the predicted benefits of completing Year 12 – Method

The previous section illustrated the substantial variation in the predicted benefits of education across Australia, especially for the Indigenous population. However, the areas used were quite broad and did not represent contiguous regions as such, but rather five categories of areas based on scores on the ARIA+ remoteness classification. These results showed how the economic incentives to complete education varied across Australia. However, in terms of the information that individuals use to estimate those incentives, it is perhaps unrealistic to think that, for example, someone in Perth would use information based on people in Sydney. Rather, it is arguably more realistic that an individual would use information from people in close proximity to them and in their local labour market.

This section outlines the method used to estimate the predicted benefits of education by a much smaller level of geography. By doing so, it will be possible to estimate the area-level factors associated with the predicted benefits of education (as outlined in 6.2.3) as well as test how Indigenous youth respond to the particular incentives to complete high school in their local area or the labour market in which they live (as outlined in Chapter 7). The section begins by looking at the data and geography.

6.2.1 Data and geography

The benefit of using the Census to look at the predicted benefits of education is that it is possible to estimate the benefits of education by quite small geographical areas. The geographical level of analysis used in this part of the thesis is based on the SLA. In 2001 there were 1,371 SLAs across Australia. Although the average SLA (with about 300 Indigenous Australians) was large enough to estimate a separate benefit of education for, there were a number of small SLAs that did not have a sufficient sample size. Those areas with fewer than ten Indigenous males or females between the age of 18 and 54 were merged with a neighbouring SLA. Where possible, SLAs were merged with others in the same Statistical Sub-Division (SSD). After excluding migratory SLAs, this resulted in 777 merged areas. More details on this geography are given in Chapter 4. [56]

[56] Analysis of the predicted benefits of non-school qualifications by such a small level of geography is complicated by two factors. Firstly, notwithstanding the combining of a number of areas, the sample sizes for the Indigenous population are still likely to be on occasions quite low. This in itself is likely to lead to a high level of variation across the areas. Secondly, migration rates for those beyond school age are much higher than those for school-age students. Hence it can not be assumed that the estimations based on those in the area necessarily capture the actual benefits of education that a youth will eventually experience.

The level of geography used therefore falls somewhere in between a neighbourhood and a labour market. Hence although it is a compromise necessitated by the relatively sparsely settled Indigenous population, it will pick up some aspects of both types of effects.

The focus of the remainder of this chapter is on two outcomes, employment and income for those employed. Furthermore, only high school education is considered with the predicted benefits of non-school qualifications by SLA left for future work.

6.2.2 Equations linking employment and income to Year 12 completion in the area

As a quite small level of geography is used in this section, it would not be possible to run a separate estimation by area like in Section 6.1. Instead, a modified equation is set up that allows for a separate intercept term for each geographical area that is interacted with Year 12 completion and Indigenous status.

Beginning with the employment benefits of education, the probability that an individual *i*, in area *j* who is aged between 18 and 54 is employed $\left(P\left(m_{ij}=1\right)\right)$ is assumed to be a function of a set of explanatory variables and their coefficients. More specifically, the employment status of person *i* who lives in area *j* is assumed to be explained by their age, whether or not they have completed Year 12, whether or not they are female and whether or not they are Indigenous. The functional form for this specification is as follows:

Nonetheless, if those adults around them are one source of information that youth use, then the SLA based estimated will be at least proportionally related to the incentive that a youth has to continue on at school. Other factors that are likely to impact on these incentives are discussed in Chapter 7.

$$P\left(m_{ij}=1\right)=f\left(\begin{array}{l}\sum_{a=18}^{54}\left[\begin{array}{l}\delta_{1,a}^{m}Age_{a,ij}+\delta_{2,a}^{m}Age_{a,ij}Female_{ij}+\delta_{3,a}^{m}Age_{a,ij}Indig_{ij}+\\ \delta_{4,a}^{m}Age_{a,ij}Female_{ij}Indig_{ij}+\delta_{5,a}^{m}Age_{a,ij}Yr12_{ij}+\\ \delta_{6,a}^{m}Age_{a,ij}Female_{ij}Yr12_{ij}+\delta_{7,a}^{m}Age_{a,ij}Indig_{ij}Yr12_{ij}+\\ \delta_{8,a}^{m}Age_{a,ij}Female_{ij}Indig_{ij}Yr12_{ij}\end{array}\right]\\ +\sum_{j=1}^{m}\left[\delta_{9,j}^{m}+\delta_{10,j}^{m}Yr12_{ij}+\delta_{11,j}^{m}Indig_{ij}+\delta_{12,j}^{m}Yr12_{ij}Indig_{ij}\right]\end{array}\right) \tag{17}$$

Because it is not possible to run a separate estimate for each geographical area, to make sure the age profile of the area is not influencing the predicted benefits of education for that area, the probability of being employed is allowed to vary across a person's age quite flexibly. This is done in Equation (17) with a set of dummy variables for each age between 18 and 54 $\left(Age_{a,ij}\right)$. This profile is different for Indigenous and non-Indigenous males and females and each of the four combinations has a different profile depending on whether or not they completed Year 12. Because all possible ages are used, there is not an intercept term in the equation.

The shape of the age profile is the same across all geographical areas; however, there is a shift for each SLA $\left(\delta_{9,j}^{m}\right)$. There is also a shift term for each SLA for those who have completed Year 12 $\left(\delta_{10,j}^{m}\right)$, and who are Indigenous $\left(\delta_{11,j}^{m}\right)$ as well as an interaction of the two $\left(\delta_{12,j}^{m}\right)$. Because of sample size restraints, the intercept term does not vary by sex.

The analysis of employment is restricted to those aged 18 years and over to ensure the majority of people have had time to finish high school, and to those under 55 years to explicitly avoid retirement choice. The coefficients are estimated via MLE of the probit model.

After estimating the parameters of the model using those aged 18 to 54 (who are not full-time students), a prediction for lifetime employment between these ages is constructed for each SLA, conditional on completing Year 12 or not and allowed to vary by sex and

Indigenous status. For each SLA, the difference between the predictions for those who complete Year 12 and those who do not is constructed and taken to be the predicted employment benefit of education for someone living in that SLA. That is, it is assumed that someone in the area will use information from those around them of a given age to estimate what their probability of employment will be when they reach that age.

The specification for the income benefits of education is similar to that for the employment benefits of education, though it is linear and estimated via OLS. Furthermore, it is estimated over the ages of 15 to 54. Using this specification, coefficients are obtained for those employed $\left(\delta^{ym}\right)$.[57]

To take into account the income foregone and hence the opportunity cost of studying, a separate estimate is undertaken for those aged 15, 16 and 17-years-old who are currently high school students with functional form as follows:

$$y_{ij}^{stu} = \sum_{a=15}^{17}\begin{bmatrix} \delta_{1,a}^{stu} Age_{a,ij} + \delta_{2,a}^{stu} Age_{a,ij} Female_{ij} + \delta_{3,a}^{stu} Age_{a,ij} Indig_{ij} + \\ \delta_{4,a}^{stu} Age_{a,ij} Female_{ij} Indig_{ij} \end{bmatrix} + \sum_{j=1}^{m}\left[\delta_{9,j}^{stu}\right] \qquad (18)$$

For students, a separate age profile (between ages 15 and 17) is allowed for Indigenous and non-Indigenous males and females. Because of sample size constraints, however, compared to Equation (17), there is only one intercept term for each area *(j)*. For those who do not complete Year 12, predicted lifetime income is calculated by summing the predicted income from ages 15 to 54 from the main specification. For those who do complete Year 12, predicted lifetime income is calculated by adding predicted income from age 15, 16 and 17 from Equation (18) to predicted income for those aged 18 to 54 from the main specification. As it would not be feasible to estimate a separate IRR for each of the 777 areas, a 4% discount rate is assumed and predicted income is summed

[57] There were not enough Indigenous Australians in a number of areas to estimate the predicted occupation benefits of education.

over a person's life, with a separate summation for those who do and do not complete Year 12. The difference between these two is the predicted income benefit of education in the area. Once again, the predictions are calculated separately for Indigenous and non-Indigenous males and females.

6.2.3 Estimating the factors associated with the predicted benefits of completing Year 12

To look at the factors associated with the predicted benefits of education, the dependent variables are the predicted employment and income benefits of completing Year 12 in the area.[58] These are assumed to be a function of the geographical characteristics of the area (state and remoteness category) as well as the characteristics of the individuals in the area upon which the estimates of these benefits are based. These include family and social characteristics as well as employment and education characteristics and are calculated separately for Indigenous and non-Indigenous Australians.

Table 6.1 gives the variables used in the model, as well as the average value for that variable for Indigenous and non-Indigenous Australians respectively. The first two sets of variables are geographical variables and hence the averages represent the proportion of SLAs either in that state or remoteness category. The remainder of the variables are calculated as the average proportion of Indigenous or non-Indigenous Australians aged 15 to 54 in the area with that particular characteristic. The only exception to this is the variable 'CDEP scheme in the area.' This variable is for whether or not there is a CDEP scheme in the area and hence the value in the table represents the proportion of SLAs which are estimated to have a CDEP scheme. Finally, because the number of people working in the area on the CDEP scheme is based on administrative data, these figures are calculated as the proportion of the Estimated Resident Population. Those variables in italics are the base category from which comparisons are made. They are not included in the model but should be kept in mind when interpreting the results.

---

[58] As these benefits of education are themselves generated from a regression equation, their use as dependent variables should be treated with caution. As they were estimated using full Census data, they do represent what an individual might estimate for themselves if they had complete information on the area.

Table 6.1 Explanatory variables for the factors associated with the predicted benefits of completing Year 12

Independent variables	Indigenous	Non-Indigenous
New South Wales	*0.1853*	*0.1853*
Victoria	0.1364	0.1364
Queensland	0.3719	0.3719
South Australia	0.0837	0.0837
Western Australia	0.0875	0.0875
Tasmania	0.0335	0.0335
Northern Territory	0.0708	0.0708
ACT	0.0309	0.0309
Major City	*0.4607*	*0.4607*
Inner regional	0.1892	0.1892
Outer regional	0.2304	0.2304
Remote	0.0502	0.0502
Very remote	0.0695	0.0695
Aged 15 to 24	0.1884	0.1339
Aged 25 to 34	0.1609	0.1501
Aged 35 to 54	*0.6507*	*0.7160*
Speaks English only or another language and English well	*0.9910*	*0.9880*
Does not speak English well	0.0090	0.0120
Couple with children	*0.5079*	*0.6250*
Couple without children	0.1556	0.2317
Single parent with children	0.2397	0.0894
Other family	0.0968	0.0540
Currently married	*0.2492*	*0.4668*
Never married	0.6260	0.4125
Separated or divorced	0.1248	0.1207
Did not move in the last 5 years	*0.3874*	*0.4698*
Moved in the last 5 years	0.6126	0.5302
Employed in the non-government sector+	*0.6656*	*0.8036*
Employed in the government sector+	0.3344	0.1964
Employed in services+	*0.5505*	*0.4385*
Employed in agriculture+	0.0418	0.0644
Employed in mining+	0.0126	0.0188
Employed in manufacturing+	0.1549	0.1790
Employed in retail+	0.2402	0.2992
No CDEP scheme in the area++	*0.7619*	*0.7619*
CDEP scheme in area++	0.2381	0.2381
Indigenous population not employed in CDEP scheme	*0.9378*	*0.9378*
Indigenous population employed in CDEP scheme	0.0622	0.0622
Has not completed Year 12	*0.7151*	*0.3587*
Completed Year 12	0.2849	0.6413
Does not have qualifications (those who have completed Year 12)	*0.6167*	*0.4377*
Has qualifications (those who have completed Year 12)	0.3833	0.5623
Does not have qualifications (those who have not completed Year 12)	*0.8038*	*0.6891*
Has qualifications (those who have not completed Year 12)	0.1962	0.3109

Source: Customised calculations from the 2001 Census

Notes: + These variables are calculated as the proportion of the employed population.

++ These variables represent the proportion of SLAs that have that characteristic, rather than the average proportion of people in the SLA with that characteristic.

The factors associated with the predicted benefits of education are estimated across two specifications. The first does not include the three ‘education completion’ variables, whereas the second does. Two specifications are estimated because there is a distinct possibility that the education related variables are jointly determined with the predicted benefits of completing Year 12. That is, although the education-related variables are likely to influence the predicted benefits, an argument could be made that the predicted benefits in the area affect the decision of people to live in that area differently for those who have completed Year 12 or have qualifications compared to those who do not. By estimating two separate specifications it is possible to see what effect the inclusion of the problematic variables have on the coefficients for the other explanatory variables.[59]

The large variation in the Indigenous estimates presented in Section 6.1 and replicated in Section 6.3 may be an indication of substantial error around the estimates for areas with small Indigenous populations. To take into account the fact that a lot of the areas have a relatively small number of Indigenous Australians, the models for the factors associated with the benefits of education are estimated using the number of 15 to 17-year-olds (who have not completed Year 12) in the area as frequency weights. Such an analysis is similar to an individual-level analysis where the coefficient estimates represent the factors associated with the predicted benefits that a person might expect for themselves from using those in their area as their source of information.[60]

6.3 Distribution of the predicted benefits of completing Year 12 – Results

This section summarises the predicted benefits of completing Year 12 estimated by geography. The average values across the areas will show whether the predicted benefits of education estimated at the local area are similar to those for Australia. The distribution

[59] A system of equations might ultimately need to be fitted to fully take this potential endogeneity into account. However, to keep the analysis tractable, such techniques are left for future research.
[60] Not surprisingly, the coefficient estimates are more likely to be significantly different from zero if frequency weights are used compared to an un-weighted analysis. However, the size and signs of the coefficients remain reasonably constant.

of the predicted benefits will show the extent to which there are areas in Australia with benefits that are estimated to be substantially higher or lower than the national average.

6.3.1 Predicted employment benefits of completing Year 12 by SLA

The first set of results presented in this section are a set of descriptive statistics for the predicted employment and full-time employment benefits of completing Year 12. The mean, median and standard deviation of the area-level predicted benefits are presented where the second column weights the mean by the number of 15 to 17-year-old Indigenous or non-Indigenous males or females in the area.[61]

Table 6.2 Mean, median and standard deviation of predicted employment benefits of completing Year 12 by SLA – Number of years

	Mean	Mean (weighted)	Median	Standard Deviation
Indigenous				
Males	6.46	6.60	6.62	4.99
Females	8.66	8.57	8.78	5.45
Non-Indigenous				
Males	3.13	3.10	2.97	1.41
Females	6.03	5.98	5.87	1.88

Source: Customised calculations from the 2001 Census. Because a separate intercept was estimated for each SLA, it was not possible to tabulate the co-efficient estimates and p-values in an appendix. They are instead available in the accompanying spreadsheet.

The first thing to note is that the predicted employment benefits of education by SLA are higher on average for females than they are for males. For both males and females, the predicted benefits were higher for the Indigenous compared to the non-Indigenous population. Similar results were found in Chapter 5 and in Hunter (2004). For all three estimates, there was not that much difference between the weighted and the unweighted means, or between the mean and the median.

There was a much larger standard deviation for the Indigenous compared to the non-Indigenous estimates. While this is likely to be partly explained by the lower sample sizes upon which the Indigenous estimates were based (leading to higher standard errors), as

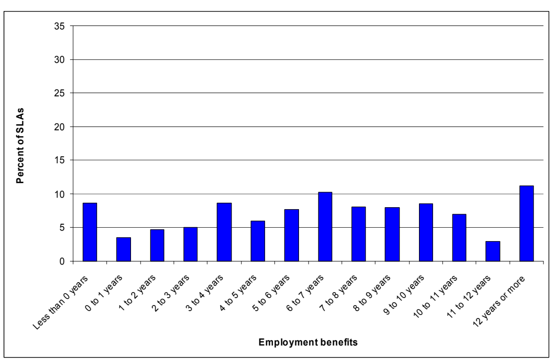
[61] This standard deviation is not the standard error of the estimated coefficients but rather the variation in the predicted benefits across the areas.

the estimates come from Census data the results do nonetheless represent what a person in the area would estimate if they used those around them on Census night as their source of information. This shows that although the association completing high school appears to have on the probability of an Indigenous Australian being able to gain employment is relatively high, there are still likely to be a number of areas where the predicted benefits are quite low.

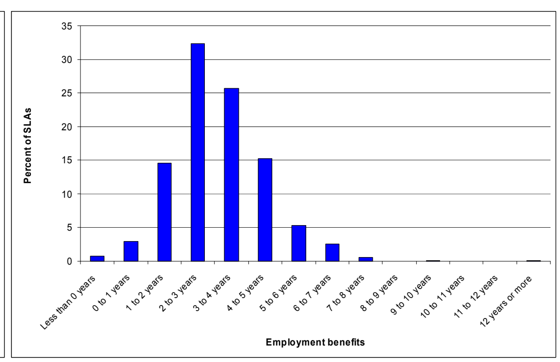
This is further illustrated by the following diagram that gives the distribution of the predicted employment benefits of education by SLA. The x-axis represents one-year grouping of predicted benefits (apart from the first and last group which are open ended) and the y-axis the proportion of areas that fall in that group. As there is not a male or female specific intercept term in Equation (17), the shape of the distribution for Indigenous females is very similar to the shape of the distribution for Indigenous males (and non-Indigenous females to non-Indigenous males). Hence, only the results for the male populations are presented.

Figure 6.5 Distribution of predicted employment benefits of completing Year 12

6.5a Indigenous male



6.5b Non-Indigenous male



Source: Customised calculations from the 2001 Census. Because a separate intercept was estimated for each SLA, it was not possible to tabulate the co-efficient estimates and p-values in an appendix. They are instead available in the accompanying spreadsheet.

Figure 6.5 shows that the distribution of the employment benefits of education is much flatter for the Indigenous compared to the non-Indigenous population. Furthermore, despite the finding in Table 6.2 that the Indigenous population has higher predicted employment benefits, Figure 6.5 shows that a much higher proportion of areas have a predicted difference in lifetime income that is less than zero (8.6% for Indigenous males compared to 0.8% for non-Indigenous males). That is, there are a number of areas in Australia where an Indigenous Australian who does not complete high school has higher predicted lifetime employment than an Indigenous Australian who does complete Year 12.

6.3.2 Predicted income benefits of completing Year 12 by SLA

This section looks at the predicted income benefits of completing Year 12. Once again, the following table presents results separately for Indigenous and non-Indigenous males and females and gives the mean (unweighted and weighted), median and standard deviation of the area-level estimates.

Table 6.3 Mean, median and standard deviation of predicted income benefits of completing Year 12 for those employed by SLA – Discounted gross personal lifetime income ($2001)

	Mean	Mean (weighted)	Median	Standard Deviation
Indigenous				
Males	81,539	87,973	77,094	126,623
Females	62,108	68,542	57,663	126,623
Non-Indigenous				
Males	99,024	100,188	97,750	47,622
Females	77,660	78,825	76,386	47,622

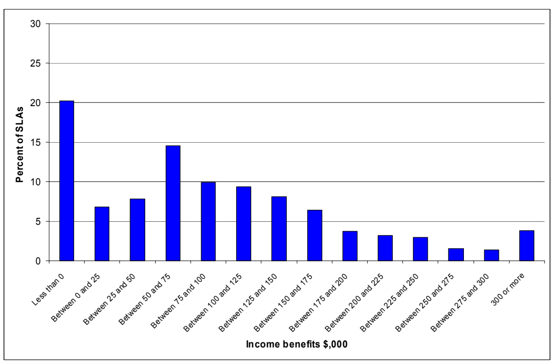
Source: Customised calculations from the 2001 Census. Because a separate intercept was estimated for each SLA, it was not possible to tabulate the co-efficient estimates and p-values in an appendix. They are instead available in the accompanying spreadsheet.

On average, the predicted income benefits of completing Year 12 are higher for males than they are for females and higher for the non-Indigenous population compared to the Indigenous population. This is in comparison to the results presented in Tables 5.5 and 5.6 in the previous chapter which showed that when estimated at the national level, the income benefits of Year 12 were marginally higher for the Indigenous compared to the non-Indigenous population. For the Indigenous population, the weighted mean is higher than the unweighted mean, showing that those areas with relatively high numbers of Indigenous Australians aged 15-17 are those with relatively high predicted benefits.

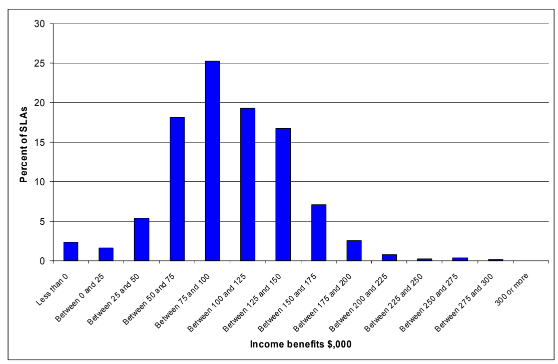
Once again, the standard deviations for the Indigenous population are much higher than that for the non-Indigenous population. Indeed, for those employed and those employed full-time, the standard deviation is higher than the mean, showing that although there are a number of areas where the predicted income benefits are quite high, there are also a number of areas where the predicted benefits are quite low. This is further demonstrated by Figure 6.6 which plots the distribution of SLAs by the predicted income benefits for those employed (the other two outcome variables have a similar distribution). The x-axis groups the SLAs into $25,000 groups with the labels given in thousands of dollars. Once again, as the distribution of female benefits is the same as male benefits, results are presented for Indigenous and non-Indigenous males only.

Figure 6.6 Distribution of predicted income benefits of completing Year 12

6.6a Indigenous male



6.6b Non-Indigenous male



Source: Customised calculations from the 2001 Census. Because a separate intercept was estimated for each SLA, it was not possible to tabulate the co-efficient estimates and p-values in an appendix. They are instead available in the accompanying spreadsheet.

According to Figure 6.6, in a little over one-fifth (20.2%) of SLAs, for those employed the predicted lifetime income of those Indigenous males who complete Year 12 is less than the predicted lifetime income of those that do not. For the non-Indigenous population this is true for only 2.3% of SLAs.

Once again, this section has shown substantial variation in both the predicted employment and income benefits of education for the Indigenous population by geography. One explanation for this is that there are a number of areas with low Indigenous populations where it is hard to get accurate estimates of the benefits of education. The implication of this, however, is that if potential students are forced to rely on those Indigenous adults around them as their source of information, then they too will find it difficult to obtain accurate estimates of whether it is economically worthwhile completing Year 12.

6.4 Factors associated with the predicted benefits of completing Year 12

Section 6.3 showed that there was substantial variation in the predicted benefits of completing high school if estimated separately by geographical area, especially for the Indigenous population. This means that, despite having relatively high predicted benefits of education at the national level, there are a number of areas where the predicted benefits of education are low or even negative. This section presents the results for the factors associated with this variation. This will help explain why certain areas might have relatively high or low benefits, as well as help target any policy interventions that are designed to deal with low economic incentives to undertake high school. Section 6.4.1 looks at the factors associated with the employment benefits of completing Year 12 and Section 6.4.2 the factors associated with the income benefits of completing Year 12 (for those employed).

For those explanatory variables that are binary (for example the variable for the SLA being in Victoria or in an inner regional area), the coefficients can be interpreted as the difference in the predicted employment or income benefit of completing Year 12 if the SLA is in that state or has that remoteness classification compared to if it is in New South Wales or in a major city respectively. In addition, the coefficient for the 'CDEP scheme in the area' variable refers to the difference in the predicted benefit of completing Year 12 for those SLAs that have a CDEP scheme in the area compared to those that do not. A positive value represents a predicted increase in the benefit of completing Year 12 after changing that characteristic (whilst holding all other variables constant), a negative value a predicted decrease.

For those variables that measure the characteristics of those in the SLA, the coefficient can be interpreted as the difference in the predicted benefit of completing Year 12 between an SLA where no-one has that characteristic compared to an SLA where everyone has that characteristic. As these two extremes may not always be realistic, it may be useful to re-scale the variables when interpreting the results. So, for example, if one was interested in the predicted change in the employment benefit of completing Year 12 between an area where the proportion of the population who had moved in the last five years was 0.50 compared to 0.40 (an increase of 10% or 0.10), then the relevant coefficient would need to be divided by 10. Alternatively, if one was interested in the predicted change between an area where all of the population worked for the government compared to where only half the population did, then the coefficient would need to be divided by 2.

Those variables that are not significant at the 10% level of significance are labelled n.s.. Those significant at the 10% level but not at the 5% level of significance have an ** next to the coefficient and those significant at the 5% level but not the 1% level have an *. The second last line of the table gives the Adjusted R-Squared for the estimate. The final line of the table gives the effective sample size of the estimate or the number of 15 to 17-year-olds in the area used as frequency weights.

Once again, as the distribution of male and female predicted benefits are the same (only the level changes), only the factors associated with the Indigenous male and non-Indigenous male predicted benefits are presented. However, the explanatory variables are created by summing across males and females.

6.4.1 Factors associated with the predicted employment benefits of completing Year 12

The presentation of the factors associated with the benefits of completing Year 12 begins with the employment benefits. The coefficients in Table 6.4 should be interpreted as the increase in the predicted difference between the number of years employed for someone in the SLA who has completed Year 12 compared to someone who has not completed Year 12.

Table 6.4 Factors associated with the employment benefits of education in the SLA – Indigenous and non-Indigenous males

	Indigenous males		Non-Indigenous males	
	Spec. 1	Spec. 2	Spec. 1	Spec. 2
Victoria	-1.12	-0.94	0.13	-1.37
Queensland	-1.83	-0.70	-0.33	-0.55
South Australia	-0.80	-0.91	-0.23	-1.22
Western Australia	-1.27	-0.49	-0.39	-0.12
Tasmania	-2.19	-2.70	-0.37	-0.60
Northern Territory	1.62	1.04	-1.94	-2.45
Australian Capital Territory	1.40	1.40	-1.15	-1.74
Inner regional	0.29	n.s.	0.19	0.28
Outer regional	0.23**	n.s.	0.28**	0.27
Remote	1.70	1.59	-0.32	-0.17
Very remote	n.s.	n.s.	n.s.	-0.86
Aged 15 to 24	6.68	13.32	-10.75	-7.43
Aged 25 to 34	6.45	12.19	-5.88	-5.28
Speaks English not well or not at all	8.69	5.50	16.02	-1.77
Couple without children	n.s.	-1.87	n.s.	9.53
Single parent with children	10.78	7.44	27.15	10.83
Other family type	9.80	6.90	10.66	9.12
Never married	n.s.	1.45	n.s.	0.21
Widowed/separated/divorced	7.83	3.64	-7.86	1.68
Moved in the last 5 years	4.06	4.16	-1.25	-0.64
Employed by the government	-3.28	-4.75	9.03	9.07
Employed in agriculture	-5.57	-8.04	2.87	-1.64
Employed in mining	4.93	-4.19	6.33	3.99
Employed in manufacturing	-2.61	-6.00	4.63	4.95
Employed in retail or hospitality	-1.51	n.s.	1.38	2.00
CDEP scheme in the area	n.s.	0.23	n.s.	0.16
Proportion employed in CDEP scheme	n.s.	-1.27	n.s.	-0.32
Completed Year 12	n.a.	-8.22	n.a.	-8.48
Has qualifications (those completed Year 12)	n.a.	12.59	n.a.	1.79
Has qualifications (those not completed Year 12)	n.a.	-12.31	n.a.	-8.10
Constant	n.s.	-0.96*	n.s.	5.76
Adjusted R-squared	0.2143	0.3175	0.6441	0.7444
Effective sample size	22,478	22,478	652,178	652,178

Source: Customised calculations from the 2001 Census. Coefficient estimates for all the variables as well as p-values are given in Table 6A.9 and 6A.10

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

Those Indigenous youth who live in the Northern Territory and the Australian Capital Territory would predict the highest employment benefit of completing Year 12 if they used those around them as their source of information. Those in Victoria, Queensland, South Australia and Western Australia would all predict slightly lower predicted benefits than New South Wales, whereas those in Tasmania would predict the lowest benefit. There is not that much difference by remoteness classification, with the exception being remote areas where the prediction is significantly and substantially higher than the prediction in areas in major cities (this was also shown in Figure 6.1a using a somewhat different methodology).

Those who live in areas with a young population would predict a higher employment benefit, as would those living in areas with a high proportion of people living in single parent families. Government sector employment is associated with a lower predicted benefit of completing Year 12 for Indigenous youth. This is in contrast to the non-Indigenous population where it is associated with a higher predicted benefit. Agriculture and manufacturing employment are all also associated with lower benefits. Having a CDEP scheme in the area is associated with a higher predicted benefit of completing Year 12. However, this is only the case if participation rates are low with those who live in areas where a high proportion of the population is employed in the CDEP scheme predicting a lower predicted benefit.

Those areas with a high proportion of the population who have completed Year 12 have a lower predicted benefit. This implies that in areas where the relative supply of Year 12 completers is low, there may be a premium in the employability of those that have completed Year 12. The association with the level of qualifications in the area shows that non-school qualifications are one way in which Indigenous Australians can enhance the benefits of completing Year 12 or, if they have not done so, make up some of the difference.

6.4.2 Factors associated with the predicted income benefits of completing Year 12 for those employed

The next set of empirical results looks at the factors associated with the income benefits of completing Year 12 for those employed. The coefficients should be interpreted as the predicted increase in the difference between net lifetime income for someone in the SLA who has completed Year 12 compared to someone who has not completed Year 12 after changing that particular characteristic. To keep the presentation of the results tractable, the coefficients have been rescaled so they represent increases or decreases in thousands of dollars.

Table 6.5 Factors associated with the income benefits of education for those employed in the SLA – Indigenous and non-Indigenous males

	Indigenous males		Non-Indigenous males	
	Spec. 1	Spec. 2	Spec. 1	Spec. 2
Victoria	-24.6	-21.65	-3.7	-16.45
Queensland	-11.3	4.30	-4.3	-5.91
South Australia	-21.2	-22.52	-22.6	-29.79
Western Australia	-8.0	5.12	-31.4	-27.80
Tasmania	n.s.	n.s.	-2.1	-8.55
Northern Territory	n.s.	-11.55	-33.7	-36.22
Australian Capital Territory	23.7	17.13	18.4	13.75
Inner regional	7.2	3.00*	13.7	14.42
Outer regional	8.7	6.50	18.3	17.47
Remote	n.s.	n.s.	13.8	14.66
Very remote	14.5	13.26	5.5	8.46
Aged 15 to 24	-208.4	-123.68	-497.3	-346.80
Aged 25 to 34	n.s.	89.26	-215.0	-193.29
Speaks English not well or not at all	44.6	n.s.	-51.7	-272.33
Couple without children	277.9	253.77	103.8	98.47
Single parent with children	77.7	26.82	370.4	129.81
Other family type	100.4	53.06	69.4	8.23
Never married	68.5	91.11	206.5	167.14
Widowed/separated/divorced	n.s.	-43.79*	-675.9	-453.06
Moved in the last 5 years	-56.2	-56.20	29.2	33.40
Employed by the government	29.7	13.60*	-36.3	-40.05
Employed in agriculture	20.5*	n.s.	-135.7	-179.66
Employed in mining	56.3	-79.83	-421.5	-449.07
Employed in manufacturing	38.8	n.s.	-174.9	-144.96
Employed in retail or hospitality	-69.7	-26.98	-198.9	-152.95
CDEP scheme in the area	-3.8**	n.s.	8.0	5.58
Proportion employed in CDEP scheme	46.8	29.28	-6.5	-3.59
Completed Year 12	n.a.	-93.07	n.a.	-60.19
Has qualifications (those completed Year 12)	n.a.	225.33	n.a.	143.66
Has qualifications (those not completed Year 12)	n.a.	-242.38	n.a.	-202.51
Constant	33.6	n.s.	233.0	234.80
Adjusted R-squared	0.1112	0.1834	0.6739	0.6977
Effective sample size	22,478	22,478	652,178	652,178

Source: Customised calculations from the 2001 Census. Coefficient estimates for all the variables as well as p-values are given in Table 6A.11 and 6A.12

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

Areas in major cities have lower predicted benefits than all other remoteness classifications (apart from remote Australia) with areas in very remote Australia having the highest predicted benefit. Similar results were found in Figure 6.5. However, that these results hold after controlling for the education characteristics of the area shows that relative scarcity of skilled labour is not the only explanation. While this is an avenue for future research, the results may be because education is concentrated amongst those with high levels of ability in these areas (as proposed in Chapter 3).

Government employment is associated with a slightly higher predicted income benefit for the Indigenous population but a lower predicted benefit of education for the non-Indigenous population. Although the Australian Public Service Commission highlights the benefit of work in the public service,[62] perhaps more emphasis could be made in schools about the additional benefits for those who have completed Year 12.

Interestingly, living in areas with a high proportion of the population employed in the CDEP scheme is associated with a higher income benefit of completing Year 12 for Indigenous youth. It would seem, therefore, that CDEP employment blunts the employment incentives to complete Year 12, but for those who are employed, CDEP employment does not reduce the extra income that a Year 12 completer is able to obtain.

6.5 Variation in the predicted benefits of education by geography – Summary

The Indigenous population live across a much wider geography than the non-Indigenous population. For example, in Chapter 2 it was shown that while around 30% of the Indigenous population lived in major cities in 2001, this made up only 1.1% of the total population in these areas. In very remote Australia, on the other hand, Indigenous Australians made up 38.3% of the population. The resource endowments and types of labour markets are likely to be quite different in the less urbanised parts of Australia as is the relative supply and demand of skilled and unskilled labour. Given these differences, there is likely to be a different relationship between education and employment and

[62] http://www.apsc.gov.au/indigenous/index.html.

income. If youth are more likely to use information from those around them to predict what the benefits of education might be, then the incentives to complete high school and non-school qualifications might also vary.

Separate estimates of the predicted benefits of education across the five remoteness classifications based on the ARIA+ index were presented in Chapter 6. Quite high employment and full-time employment benefits of education were found for the Indigenous population in remote and very remote Australia especially when looking at the benefits of completing qualifications for those who did not complete Year 12. The income benefits of qualifications were quite high in very remote Australia, but those in remote Australia had similar predictions to those in outer regional areas. This probably reflects the low supply of workers in these areas with qualifications and hence a premium placed on their wages.

The predicted benefits of completing high school were also estimated by a much smaller geography based on SLA. While the average predicted benefits of high school across Australia were similar to the estimates using national-level data for Indigenous and non-Indigenous males and females, there was substantially more variation across the regions for the Indigenous estimates. While this is not surprising given the lower numbers of Indigenous Australians in each region, it does highlight the potential uncertainty for Indigenous youths in determining how economically worthwhile education is. Using such a small level of geography (there were 777 regions across Australia) also allowed an examination of the area-level factors that were associated with the predicted benefits of education.

Those Indigenous youth who live in areas where a high proportion of the population is employed in the CDEP scheme would predict a relatively low employment benefit of completing Year 12. Compared to the employment benefits, however, having a high proportion of the population employed in the CDEP scheme was associated with a higher income benefit of education.

For both the Indigenous and non-Indigenous population, those areas which had a low proportion of the population who had completed Year 12 had a higher predicted employment and income benefit of high school education. In these areas either the unobserved costs of education are high, or the demand for the labour of those who have completed Year 12 is at least partly inelastic and hence the relatively low supply is leading to a wage premium.

Chapter 7 – The individual, household and neighbourhood characteristics associated with education participation of Indigenous youth

Individuals benefit substantially from attending and eventually completing high school. This could be through an enhanced ability to find employment, especially in a relatively high-paying position, as well as improved health outcomes and other non-economic benefits. In essence, education is one of the key factors in improving a person's capabilities (Sen 1999).

Previous chapters have shown that for those who complete Year 12, the employment, income and health benefits are usually as high or higher for the Indigenous compared to the non-Indigenous population. However, despite these apparently large economic and health benefits, high school participation rates of Indigenous Australians continue to be well below those of the non-Indigenous population (ABS 2006a).

Under the HCM outlined in Chapter 3, there are two potential reasons why a population subgroup might have high predicted benefits of education but low levels of participation. The first reason is a non-linear relationship between ability and net lifetime income where the majority of the Indigenous population on the flat part of the distribution with the costs outweighing the benefits of education but a small minority with quite high net benefits. The second potential reason is that there are unobserved costs or barriers to education that lead to the observed economic benefits of education being high for those who undertake education. However, for the majority of the population, the social, transport or other physical costs make education not worthwhile. There may be social costs to high school education if a person participates in and completes levels of education above what is common for either peers or older cohorts in their area.[63] The

[63] There may also be social costs of completing education levels below what is standard in a person's community. This would tend to increase the difference in high school completion between Indigenous and non-Indigenous Australians.

other potential barrier to education discussed in Chapter 3 is Indigenous youth underestimating their own ability and therefore their own benefits of education.

Identifying whether Indigenous youth are responding to economic incentives to undertake education at the local level would help determine whether it is the distribution of economic incentives that are resulting in Indigenous youth under-investing in education. Furthermore, identifying the social costs and benefits of education that are associated with high school participation would therefore be useful in designing policy to help Indigenous youth take advantage of the potential benefits of high school education. Both of these can be done through an area-level analysis. According to Vartanian and Gleason (1999, p.22) 'If neighborhood conditions are important, then policies that focus solely on developing individuals' skills without dealing with his or her surroundings are unlikely to be completely successful in reducing the high school dropout rate and increasing educational attainment.'

For a long time, the fields of sociology and developmental psychology have researched the effect of a child's area (or neighbourhood) on their individual characteristics (see for example, Sewell and Armer 1966 for one of the earlier studies). In comparison, substantial interest from the field of economics is relatively recent. Despite this, there is now a large and growing body of literature looking at the relationship between a person's area-level context and their education participation and attainment (see, for example, the survey of the literature in Durlauf 2004).

While the literature on area-level or neighbourhood effects on educational outcomes is dominated by research focussing on the USA[64] there have been a few studies in Australia in this area. Jensen and Seltzer (2000) found that, using a specifically designed survey of 171 Year 12 students in Melbourne, area-level characteristics from the corresponding Census were associated with the decision to continue their education beyond high school. In addition, the ABS routinely includes a measure of economic disadvantage at the area-

[64] This is caused in part by the size of the research community in the USA relative to other countries; however, it is also as a result of the funding arrangement for schools in the USA which are usually based on taxes at the local level (Overman and Heath 2000).

level called the Socio-Economic Index for Areas (SEIFA) (ABS 2004b) on its surveys which can then be used as explanatory variables in individual-level analysis.

Although there are a few studies of area-level effects in Australia, to the author's knowledge at least there are none that quantify the impact on the educational outcomes of Indigenous Australians (beyond using remoteness variables). This is despite the fact that Indigenous youth have one of the lowest high school completion rates in the country and have a unique geographical distribution across Australia. Furthermore, a number of authors and policy-makers (for example Johns 2006; Brough 2006) identify area-level characteristics and incentives as one of the reasons for low levels of participation. This chapter goes some way towards filling this gap by looking at the association between a set of area-level factors and high school participation. These area-level factors include the predicted benefits of education presented and discussed in Chapter 6, as well as the educational characteristics of others in the area.

To be able to interpret the area-level characteristics, it is important to control for the individual and household characteristics of those who live in the area. For this reason, not only are models estimated with an individual 15, 16 or 17-year-old as the unit of analysis, but also a range of individual and household characteristics are controlled for in these models. As such a data set has not been used before to analyse Indigenous high school participation, the association with these variables also have their own important policy implications.

Section 7.1 outlines the data and methods used to look at the factors associated with high school participation. Section 7.2 presents the results for a simplified model which contains individual and household level variables only before looking at the association between the area-level characteristics and education participation for 15 to 17-year-olds (in 7.3). Section 7.4 concludes the chapter by discussing briefly how the evidence presented can be used to inform policy related to Indigenous education.

7.1 Data and method

To look at the factors associated with high school participation, a series of individual-level equations are estimated where the dependent variables measure education participation and the independent variables characteristics of the individual, the individual's household and their area. The analysis focuses on the education participation of those 15 to 17-year-olds who have not completed Year 12. This includes those who are currently at school, those currently studying at a different type of education institution and those who are not studying at all.

The remainder of this section looks at the dependent variables as well as the area or neighbourhood level and other explanatory variables in the model. All these are taken from the 2001 Census which has been outlined in more detail in Section 4.1 of this thesis. The final part of Section 7.1 looks at the method used to quantify the association between the explanatory variables and the dependent variables.

7.1.1 Data – Dependent variables

There are two dependent variables used that capture the education participation of 15 to 17-year-olds who have not finished Year 12. The first dependent variable and the main focus of the analysis in this chapter is whether or not an individual is currently a high school student. As shown in Chapter 5, not only does high school education have relatively high predicted benefits of education but it also opens up the possibility of other forms of education (like university studies) that also improve a person's employment and income prospects. There are, however, other education options that also have quite high benefits and that were shown in Chapter 2 to be relatively popular amongst Indigenous youth. The second dependent variable is therefore whether a person is currently attending any type of education institution.

The following table gives the proportion of Indigenous and non-Indigenous males and females who have each of these characteristics. Results are presented first for those aged 15 to 17-years-old and then separately by age.

Table 7.1 Mean values of the dependent variables – By sex, Indigenous status and age

	Indigenous		Non-Indigenous	
Dependent variable	Male	Female	Male	Female
Aged 15-17				
Attending high school	0.537	0.588	0.807	0.859
Attending any education institution	0.630	0.680	0.872	0.908
Aged 15				
Attending high school	0.749	0.790	0.938	0.954
Attending any education institution	0.793	0.826	0.955	0.968
Aged 16				
Attending high school	0.510	0.574	0.811	0.860
Attending any education institution	0.620	0.686	0.880	0.913
Aged 17				
Attending high school	0.324	0.360	0.651	0.748
Attending any education institution	0.456	0.498	0.768	0.832

Source: Customised data from the 2001 Census

These results confirm that Indigenous Australians are less likely to be attending education than the non-Indigenous population, and for both Indigenous and non-Indigenous youths, females have a higher probability of attending.

7.1.2 Data – Area-level variables

The independent variables that are the focus of the analysis in this chapter are measured at the area or neighbourhood level. The same 777 regions based on SLAs that were outlined in Chapter 4 and used in Chapter 6 are also used in this chapter.[65] There are four sets of variables used that measure either the characteristics of other people who live in the area or local labour market characteristics. The first set of variables captures characteristics of the individual's peer group, the second characteristics of older cohorts of individuals and the third a prediction for the employment and income benefits of high

[65] While these are somewhat larger than the areas often considered in neighbourhood analysis, they are around the smallest level of geography from which accurate estimates of the area-level effects can be obtained (especially for Indigenous Australians).

school in the area. To look in more detail at the effect of local labour market conditions, and to a certain extent the alternatives to education in the area, the fourth set of variables includes an estimate of CDEP participation. Each of these variables are outlined in more detail below.

Peer group effects

The social costs and benefits of education are likely to be influenced by the educational activities of one's peers. Hence, the first type of area-level variable that is constructed is the proportion of the rest of the population in the area aged 15 to 17 who are currently attending high school (excluding those who have already completed high school). Peer group effects are calculated for Indigenous and non-Indigenous males and females separately.[66]

The measured association between the education participation of a person's peers and their own participation can be interpreted in two ways. Firstly, it may be capturing the direct influence of other individuals in the area through things like social norms and peer group pressure. That is, if other students are attending school at a relatively high rate, then a prospective student in the area is less likely to have a social network outside of school, especially during school hours, and less likely to feel ostracised for their own attendance.

In addition to this direct effect, the peer group variable may also be capturing unobserved area-level characteristics that impact on both the individual and the individual's peers. So, for example, if there is a high quality school in the area responsive to Indigenous student's needs, then this is not observed in the Census but will likely increase the attendance rate of both the individual and their peers. This will be picked up in the

[66] It would have been preferable to have a measure of peer groups that incorporated the actual individuals in the neighbourhood that an individual associates with. This, however was not possible given the data used with the best alternative being others in the area. Estimating the value separately for Indigenous and non-Indigenous males and females will ensure that the variable is somewhat specific to individuals. It is important to exclude the individual themselves from the calculation of the peer group variable to avoid biasing the coefficient upwards. This is especially the case for Indigenous Australians where the population in the area is usually smaller.

estimations as a correlation between the two variables. Either way, under both interpretations the association with the peer group variables and attendance of the individual will give a good summary indication of the extent to which area-level characteristics matter.

A second peer group variable is also calculated which captures the proportion of the population who are attending other types of education. Once again, this may be capturing the direct effect of the social acceptance of an alternative to high school education, or the presence of unobserved area-level effects like a high quality TAFE or other institution in the area.

Those individuals for whom there are no other potential students aged 15 to 17 in the SLA of the same Indigenous status and sex are excluded from the analysis. The following table gives the average values and standard deviations for the two peer group effects.

Table 7.2 Average peer group effect by SLA

	Indigenous		Non-Indigenous	
	Male	Female	Male	Female
Average				
High school peer group effect	53.5	58.2	80.6	85.8
Other education peer group effect	9.0	9.1	6.6	4.9
Standard deviation				
High school peer group effect	19.5	19.7	7.7	6.9
Other education peer group effect	9.8	9.8	3.3	3.2

Source: Customised data from the 2001 Census

Role model effects

In addition to those of the same age as themselves, youths are likely to be influenced by adults in the area. The second set of area-level variables therefore captures characteristics of two older cohorts of individuals in the area. The first two variables measure the percentage of the population aged 18 to 29 and aged 30 years and over in the area that completed Year 12. The second two measure the proportion of the same two cohorts who have completed a post-school qualification. Both sets of variables are calculated separately for Indigenous and non-Indigenous males and females.

The high school variables may be capturing the social acceptance and expectation of high school education in the area. That is, those areas with a high proportion of the population who have completed Year 12 are more likely to expect the younger generation to complete Year 12 themselves and there may be greater acceptance in the community of the social benefits and other externalities of high school.

The qualification variables are likely to have two effects, each working in different directions. Firstly, a relatively high proportion of the population who have completed qualifications in the area may lead to greater acceptance of an alternative form of education, leading to youths being less likely to attend high school and more likely to attend other forms of education. Alternatively, high school is often a prerequisite for other types of education and hence a high proportion of the population with qualifications may lead to students also wanting to undertake post-secondary education and hence help them see the benefit of completing high school first.[67]

Identifying the association with the Year 12 completion rates in the area and education participation of 15 to 17-year-olds will help target those areas where education participation could be expected to be low. In addition, it will give some indication of the potential future externalities from increasing the attendance rates of today's youth. Because qualification levels are more amenable to current policy interventions, the association with these variables may also show ways in which the education participation of adults can improve the education participation of today's youth.

Once again, those individuals for whom insufficient information is available on the role model effects in the SLA are excluded from that part of the analysis. The following table gives the average value and standard deviations for the four role model effects.

[67] It would have been preferable to set up two qualifications variables, one which captures those types of education that are an alternative to high school, and another which captures those levels of education for which high school is a prerequisite. Unfortunately though, sample size and data constraints (that is, only having information on highest qualifications) makes this not possible.

Table 7.3 Average role model effect by SLA

	Indigenous		Non-Indigenous	
	Male	Female	Male	Female
Average				
Percentage aged 18 to 29 completed Year 12	27.1	32.6	58.4	68.7
Percentage aged 30 and over completed Year 12	12.3	13.4	36.4	34.2
Percentage aged 18 to 29 with qualifications	17.8	16.1	39.0	38.5
Percentage aged 30 and over with qualifications	23.7	17.4	51.2	32.3
Standard deviation				
Percentage aged 18 to 29 completed Year 12	16.3	16.9	14.1	12.0
Percentage aged 30 and over completed Year 12	8.6	8.2	14.1	11.5
Percentage aged 18 to 29 with qualifications	11.3	11.5	5.7	7.6
Percentage aged 30 and over with qualifications	13.1	9.8	10.1	10.6

Source: Customised data from the 2001 Census

The above table shows that Indigenous adults are less likely to have completed Year 12 and other qualifications. Those aged 18 to 29 are more likely to have completed Year 12, but less likely to have qualifications than those aged 30 and over (apart from non-Indigenous females).

Predicted benefits of education in the area

At the national level, it is clear that the Indigenous population is not completely responding to the relatively large predicted benefits of education outlined in Chapter 5. Within the Indigenous population there may still, however, be variation in high school participation as a response to variation in the predicted benefits of education outlined in Chapter 6. Hence the third set of area-level variables is the predicted benefits of high school education in the area. The two economic benefits of education that were focussed on in Section 6.4 are also used in this chapter. That is, the difference in predicted lifetime employment by education and the difference in lifetime income for those who are employed.

The models also control for the respective predicted lifetime income or employment for those who do not complete Year 12. These variables are included firstly because youths are likely to take into account not only the benefit from education, but what they would otherwise receive if they did not complete Year 12. That is, if they live in an area where those who do not complete high school have a reasonably high probability of employment or high predicted lifetime income, then a large benefit from high school may not be enough to persuade them to undertake education. Alternatively the predicted values for non-high school completers may be capturing the base level of economic activity in the area (which may be positively associated with attendance).

The following table gives the average and standard deviation of the predicted benefits of education, as well as predicted lifetime income and employment for those who do not complete high school.[68]

Table 7.4 Average predicted benefits of education and predicted employment or income for those who do not complete Year 12 by SLA

	Indigenous		Non-Indigenous	
	Male	Female	Male	Female
Average predicted benefit				
Employment benefit	6.60	8.62	3.10	5.99
Income benefit for those employed	87,900	68,878	99,927	79,101
Average for non high school completers				
Lifetime employment	20.12	14.45	29.64	22.52
Lifetime income for those employed	497,255	421,107	654,175	460,848
Standard deviation of predicted benefit				
Employment benefit	4.02	4.19	1.16	1.51
Income benefit for those employed	82,892	83,658	37,230	37,300
Standard deviation for non high school completers				
Lifetime employment	4.25	4.16	2.03	2.73
Lifetime income for those employed	125,351	126,367	93,858	93,997

Source: Customised data from the 2001 Census

CDEP scheme in the area

An Indigenous-specific labour market program that has been predicted by some authors to potentially have a detrimental effect on high school attendance is the CDEP scheme (Hunter 2003). This is because the scheme may provide either a relatively well paid or a socially acceptable alternative to education. Furthermore, some of the recent changes to the CDEP scheme have been motivated at least in part by these potentially adverse effects (DEWR 2005; 2006). To test this proposition empirically, the final set of area-level variables used in this chapter capture the presence of the CDEP scheme in the area. Two

[68] These calculations are slightly different to the summary statistics that were given in Chapter 6 as they are weighted by the 15 to 17-year-old population in the areas.

variables are used, both outlined in more detail in Biddle and Hunter (2006b). The first captures whether there are any CDEP scheme participants in the SLA and the second measures the proportion of the estimated resident population (ERP) employed in the CDEP scheme.

The following table gives the proportion of the 15 to 17-year-old population who live in an SLA where the CDEP scheme is present, as well as the mean and standard deviation of the percentage of the estimated resident population employed in the CDEP scheme.

Table 7.5 Proportion in an SLA with the CDEP scheme and average proportion employed in the CDEP scheme

	Indigenous		Non-Indigenous	
	Male	Female	Male	Female
Proportion in SLA with the CDEP scheme	0.492	0.491	0.190	0.189
Average percent employed in the CDEP scheme	10.88	10.69	3.48	3.42
Standard deviation of percentage employed in the CDEP scheme	19.02	17.48	12.21	12.02

Source: Customised data from the 2001 Census

7.1.3 Data – Other explanatory variables

To analyse the association between high school participation and the area or neighbourhood-level variables previously outlined, it is important to control for a range of other individual and household variables that are likely to be associated with the probability of a student attending high school. The variables used in this chapter are included to capture the social and financial constraints involved with attending school, as well as the cultural factors that determine a person's preferences for education.

Characteristics of the individual are likely to influence the motivation to attend high school. Most obviously, a person's age is likely to have a strong effect with those who are older having a higher opportunity cost of education and possibly a lower benefit of an additional year of schooling. Separate binary variables are constructed for whether the person is 16 or 17 years old, as opposed to the base case of 15.

A person's cognitive and non-cognitive ability is likely to have a strong influence on whether it is worthwhile for them to undertake education (as outlined in Chapter 3). While there are no variables on the Census that adequately capture ability, a person's English language skills are likely to capture one aspect of it. As the information on the Census for English language ability is collected only for those who speak another language, there are two alternatives to the base case constructed (where the base case is those who speak English only). The first is for those who speak another language and English well or very well and the second for those who speak a language other than English and English not well or not at all.

There are three variables constructed for a person's ethnicity and background. The first, applicable for the Indigenous population only, is for whether a person identifies as a Torres Strait Islander or both a Torres Strait Islander and Aboriginal Australian. This variable should be compared against those who identify as being Aboriginal only. The other two variables are for whether the person was born overseas and whether the person's parents were born overseas. The final individual level variable is for whether the person moved SLA in the five years preceding the Census.[69] This variable could capture the disruptive effects of having moved where those who do move have to adjust to a new set of peers, school setting and perhaps curriculum, all of which are likely to impose a social cost on the student.

A number of the aspects of the model developed in Chapter 3 are likely to be influenced by a person's household context. For example, a person's ability levels are likely to be shaped not only by their inherent characteristics, but also the combination of experiences in early learning and development. The costs of education are also likely to vary across households. As those parents and households with higher income are able to provide higher levels of income support, the opportunity cost of education to a student in a high-income household is likely to be lower. Students are able to mitigate some of the opportunity costs of education by undertaking a part-time job. There is, however,

[69] This variable is calculated using the standard SLA, rather than the 777 areas constructed for this thesis that are based on SLAs.

evidence that a large proportion of students find their part-time job through the contacts of a family member (Smith and Wilson 2002) and hence those individuals whose parents are less likely to be employed may be less able to find a part-time job themselves.

The social costs and benefits of education are also likely to be influenced by a person's household context. Those households where someone has had a positive experience with education themselves are likely to be more encouraging of children and youths in the household attending and completing high school and better able to mitigate some of the perceived racism and alienation that constitute a large social cost of education (Schwab 1999). For the Indigenous population, those students who live in households which contain non-Indigenous adults (that is mixed households) may be more likely to be exposed to people who have had positive experiences with formal education. Furthermore, to be successful at late secondary school it is likely to be beneficial to have a quiet area within the home where the student can prepare for exams and assignments. The number of other people in the household combined with the size and quality of the house the student lives in are therefore likely to impact on a youth's desire to continue on at school.

In addition to household variables, two sets of geographical variables are included in the model to capture jurisdictional effects (state or territory of usual residence) as well as the five-category ARIA+ remoteness classification outlined in Chapter 4. As these variables are not education or labour market characteristics of the area *per se* they are labelled as 'geographical variables' rather than area or neighbourhood-level variables.

The specific explanatory variables outlined in the above discussion are given in the following table by Indigenous status and sex. Those variables in *italics* constitute the base case and represent the hypothetical individual from which the marginal effects are calculated. The same base case is used for Indigenous and non-Indigenous 15 to17-year-olds. For the continuous variables in the model – equivalised income of other individuals in the household, number of people in the household and the number of people per bedroom – the value in the table is the mean.

Table 7.6 Individual, household and geographic variables associated with high-school attendance

Explanatory variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Aged 15	*0.342*	*0.356*	*0.346*	*0.348*
Aged 16	0.355	0.343	0.352	0.356
Aged 17	0.303	0.301	0.303	0.296
Does not speak a language other than English	*0.877*	*0.868*	*0.893*	*0.890*
Speaks another language and English well	0.104	0.117	0.106	0.108
Speaks another language and English not well	0.020	0.015	0.002	0.002
Identifies as Aboriginal only	*0.909*	*0.910*	n.a.	n.a.
Identifies as Torres Strait Islander or both Aboriginal and Torres Strait Islander	0.091	0.090	n.a.	n.a.
Born in Australia	*0.967*	*0.969*	*0.892*	*0.893*
Born overseas	0.033	0.031	0.108	0.107
Both parents born in Australia	*0.929*	*0.929*	*0.633*	*0.634*
Parents born overseas	0.071	0.071	0.367	0.366
Did not move between 1996 and 2001	*0.716*	*0.699*	*0.791*	*0.778*
Moved between 1996 and 2001	0.284	0.301	0.209	0.222
New South Wales	*0.323*	*0.313*	*0.333*	*0.333*
Victoria	0.062	0.058	0.251	0.253
Queensland	0.259	0.261	0.182	0.180
South Australia	0.058	0.061	0.085	0.084
Western Australia	0.131	0.132	0.097	0.096
Tasmania	0.051	0.054	0.027	0.028
Northern Territory	0.107	0.109	0.006	0.006
ACT	0.010	0.012	0.019	0.019
Major city	*0.252*	*0.259*	*0.544*	*0.546*
Inner regional	0.268	0.267	0.319	0.320
Outer regional	0.229	0.227	0.118	0.116
Remote	0.063	0.058	0.012	0.011
Very remote	0.187	0.190	0.007	0.007
Single-person household	0.007	0.006	0.004	0.004
Highest education in the household a degree	0.061	0.058	0.234	0.235
Highest education other qualification without Year 12	0.155	0.146	0.165	0.161
Highest education other qualification with Year 12	0.091	0.087	0.203	0.205
Highest education Year 12 but no qualification	0.138	0.137	0.162	0.162
No-one in household completed Year 12 or has qualification	*0.555*	*0.571*	*0.237*	*0.237*
No adult in the household with different Indigenous status	*0.448*	*0.457*	*0.996*	*0.995*
At least one adult with different Indigenous status	0.552	0.543	0.004	0.005
Number of people in the household	5.306	5.250	4.223	4.221
No children under 15 in the household	*0.349*	*0.326*	*0.489*	*0.490*
A child under 15 in the household	0.651	0.674	0.511	0.510
Number of people per bedroom in the household	1.655	1.656	1.197	1.199
No-one in the household owns or is purchasing the home	*0.665*	*0.696*	*0.211*	*0.222*
Household owns or purchasing home	0.335	0.304	0.789	0.778
Equivalised income of others in the household	315.8	306.8	520.3	518.5

Source: Customised data from the 2001 Census

Ginther, Haveman and Wolfe (2000: p633) note that 'confidence that a reported significant neighborhood effect reveals a true relationship requires a model specification that is comprehensive in describing the full range of family and individual background that may also influence children's attainment.'[70] While the list of individual, household and geographical variables outlined above is far from complete (due to the constraints imposed on a researcher using the Census) they are likely to be extensive enough to have a reasonable level of faith in the robustness of the coefficients for the area or neighbourhood-level variables.

7.1.4 Specification

As the dependent variables are binary, the probit model is once again used and estimated via maximum likelihood estimation. A separate estimate is carried out for Indigenous and non-Indigenous males and females to capture the possibility that not only is the probability of attending high school likely to be different, but so too are the associations with other variables (as found, for example in Vartanian and Gleason 1999 and Turley 2003).[71]

Results from a specification without area-level characteristics (that is those variables from Table 7.6 only) is presented in Section 7.2. In Section 7.3 the models with the area-level variables are included. Although the individual and household variables are still included in the estimations, the presentation of the results focus on the marginal effects for the area-level variables only, with the full results available in the Appendix to this chapter. As the different sets of area-level variables are likely to be jointly determined and there are unlikely to be instruments available to identify the separate effects, a separate specification is used for each of the four sets of area-level variables.

[70] While Ginther, Wolfe and Haveman (2000) advocate the use of family level variables, due to the nature of Indigenous mobility and residential circumstances outlined in previous chapters, household-level variables were considered to be more appropriate for the analysis in this chapter.
[71] A single model was also estimated with binary variables for Indigenous males, Indigenous females and non-Indigenous females. All variables were significantly different from zero.

7.2 Results – Individual, household and geographical factors associated with education attendance

While the characteristics of the area in which a person lives are important factors in explaining the social and economic incentives to undertake high school education, a person's individual and household characteristics are likely to shape how they respond to those incentives. By identifying the individual and household characteristics that are associated with low participation, policy may be targeted towards those youth who may not reach their potential productivity and the chances of Indigenous youth taking advantage of the economic benefits of education might be improved. Furthermore, identifying those variables that have a positive association, the experiences of successful students can be learnt from.

The results for the association between the individual, household and geographical variables and high school participation are presented as marginal effects. For those explanatory variables that are binary, the marginal effect refers to the change in the predicted probability of the event occurring after changing that characteristic only. These changes in the probability of attending should be compared against the probability of the base case, which is given in the third-last line of the tables (with the characteristics of the base case given in text below the table). So, as an example, the first number in Table 7.7 means that a 16-year-old Indigenous male is estimated to have a predicted probability of attending high school that is 0.273 lower than the probability of an otherwise identical 15-year-old, estimated to be 0.707.

The results for the continuous or count variables are also presented as marginal effects however they are calculated slightly differently. For the variable measuring equivalised gross personal income of others in the household, the predicted change in the probability of attending high school is from increasing income from the mean ($508) by one standard deviation ($340). For the 'extra person in the household' variable the predicted change in probability is for a five-person household compared to a four-person household. Finally, for the ‘extra person per bedroom’ variable, the predicted difference in probability is for a household with two people per bedroom compared to one person per bedroom.

Those variables that were not significant at the 10% level of significance are marked as n.s. with those only significant at the 10% but not the 5% level marked with an ** and those significant at the 5% but not 1% level of significance marked with an *. The second last line of the table gives the Pseudo R-squared and the final line of the tables gives the sample size upon which the estimates are based.

The first table of results in this section looks at the marginal effect of the explanatory variables on the predicted probability of attending high school. There is a separate column for each of the four sex and Indigenous status combinations.

Table 7.7 Marginal effects on the probability of attending high school – Individual, household and geographic factors

	Indigenous		Non-Indigenous	
Explanatory variables	Male	Female	Male	Female
Aged 16	-0.273	-0.235	-0.228	-0.170
Aged 17	-0.463	-0.449	-0.434	-0.325
Speaks another language and English well	n.s.	-0.035**	0.071	0.055
Speaks another language and English not well	-0.126	-0.180	n.s.	-0.126
Torres Strait Islander+	n.s.	0.037*	n.a.	n.a.
Born overseas	n.s.	n.s.	0.017	0.009
Parents born overseas	n.s.	n.s.	0.012	0.004
Moved between 1996 and 2001	-0.031*	-0.074	-0.043	-0.053
Victoria	n.s.	0.044*	0.042	0.045
Queensland	0.039	0.034	0.025	0.020
South Australia	0.054*	0.045*	0.026	0.024
Western Australia	-0.093	-0.065	-0.074	-0.058
Tasmania	-0.074	-0.091	-0.080	-0.100
Northern Territory	n.s.	n.s.	n.s.	n.s.
Australian Capital Territory	0.098**	0.088*	0.059	0.031
Inner regional	n.s.	n.s.	-0.003**	-0.003*
Outer regional	n.s.	n.s.	n.s.	0.006
Remote	-0.049*	n.s.	-0.017	0.011*
Very remote	-0.080	n.s.	-0.087	-0.015*
Single person household	n.s.	n.s.	-0.164	-0.191
Highest education in the household a degree	0.183	0.105	0.119	0.080
Highest education other qualification without Year 12	0.060	n.s.	0.017	0.011
Highest education other qualification with Year 12	0.148	0.069	0.078	0.053
Highest education Year 12 but no qualification	0.113	0.050	0.072	0.049
At least one adult with different Indigenous status	0.054	0.057	-0.138	-0.156
Extra person in the household	n.s.	n.s.	-0.009	n.s.
Child under 15 in the household	0.076	0.064	0.058	0.041
Extra person per bedroom	-0.045	-0.050	-0.039	-0.045
Household owns or purchasing home	0.104	0.093	0.063	0.054
Equivalised income of others in the household	0.027	0.038	0.023	0.020
Probability of the base case	0.707	0.788	0.853	0.901
Pseudo R-squared	0.1849	0.1844	0.1913	0.1984
Number of observations	8,220	8,123	264,891	251,731

Source: Customised data from the 2001 Census. Coefficient estimates and p-values are given in Table 7A.1 and 7A.2

Base case: Aged 15; Speaks English only; born in Australia; both parents born in Australia; does not identify as a Torres Strait Islander; did not change usual residence between 1996 and 2001; lives in New South Wales; lives in a major city; no-one in the household has completed Year 12 or has a qualifications; no adults in the household of a different Indigenous status; no children under 15 in the household; lives in a four-person household with one person per bedroom; does not live in a household where someone owns or is renting the home; and the household has a equivalised income of $508.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level. +Includes those who identify as both Aboriginal and Torres Strait Islander.

The signs of the above explanatory variables for the most part fit *a priori* expectations. The probability of attending high school decreases with age, with the magnitude of the decrease smallest for non-Indigenous females. Those with poor language skills are less likely to be attending high school. If being able to speak English well is considered as one aspect of cognitive ability, then this supports to a certain extent the assumptions in Chapter 3 that those with higher levels of ability find school either more difficult or less rewarding. However, speaking a language other than English but speaking English well does not have a significant association for Indigenous males and is only significant at the 10% level of significance for Indigenous females. In other words, it is not speaking an Indigenous language that is associated with lower attendance at high school (as some of the results in Hunter and Schwab 1998 could be interpreted as meaning), but rather English language skills themselves. There is therefore little support in these results for discouraging bilingualism amongst Indigenous youth.

For the Indigenous population, identifying as a Torres Strait Islander (as opposed to Aboriginal only) was not associated with the probability of attending high school for males but was positively associated for females (at the 5% level of significance). For Indigenous males aged 15 to 17-years-old in this dataset, 62.1% of those who identify as being Torres Strait Islander were attending high school compared to 52.7% of those who identify as Aboriginal only. That this difference was not significant in the model implies that for Indigenous males at least, it may only be because of the other individual, household and geographical factors that Torres Strait Islanders have a higher rate of attendance than other Indigenous Australians.

Having moved in the last five years was associated with a lower probability of attending high school. This could be because of the disruptive effects of having moved, where those who do so have to adjust to a new school, new peers and possibly a new curriculum. However, the result could also be because those who otherwise would have decided to not attend high school are more likely to have moved in the first place because they do not have such costs of migration or may have higher benefits. That is, there may be an element of reverse causality with this variable.

The state or territory of usual residence was also significant. Living in Western Australia and Tasmania was associated with a lower probability of attendance than New South

Wales for all the estimations, whereas the variables for South Australia, Queensland and the Australian Capital Territory were significantly higher. There is not that much difference in the probability of attending high school between major cities, inner regional areas and outer regional areas. Remote areas had a lower probability for males only with the magnitude of the marginal effect quite high for Indigenous males. Very remote areas once again had a greater difference for males and Indigenous males in particular.

The characteristics of a person's household were also found to be important explanatory variables. For the non-Indigenous population those living by themselves (that is, in a single-person household) were much less likely to be attending high school. This probably represents the fact that only those who are not at high school are likely to be able to afford to live by themselves.

Education levels in the household generally had a significant association with a youth's probability of attending high school, especially for Indigenous males. Having someone in the household with a degree had the largest marginal effect with both Indigenous males and Indigenous females having a predicted probability close to 0.90 if they lived in such households (found by adding the marginal effect to the probability of the base case). Even for those households without anyone with a degree, the predicted difference in probability was quite large between those who have someone who has completed Year 12 and someone who has not. The marginal effect for those households where no-one had completed Year 12 but someone had a non-degree qualification was in general much smaller and the variable was insignificant for Indigenous females. That is, it is not only the level of education of those in the household that is important, but also the type of education. Nonetheless, there does appear to be a relationship between the education levels of those in the household and the participation rates of the younger generation.

For the Indigenous population, living in a household with non-Indigenous adults is associated with a higher probability of attending high school. However, for the non-Indigenous population, living in a household with an Indigenous adult is associated with a lower probability. The number of people in the household generally did not have a significant effect; however, the number of people per bedroom did. This implies that it is overcrowding itself that reduces education participation, rather than living in large households *per se*. Finally, access to economic resources, whether as measured by home ownership or income, had a significant and positive association with attendance.

Remembering that a relatively large proportion of Indigenous youth opt for non-school qualifications and that Chapter 5 showed reasonably large economic benefits of doing so, the next table looks at the factors associated with the probability of attending any education. Results are once again presented as marginal effects; however, there is a different probability of the base case attending education (given in the third-last line of the table).

Table 7.8 Marginal effects on the probability of attending any education – Individual, household and geographic factors

	Indigenous		Non-Indigenous	
Explanatory variables	Male	Female	Male	Female
Aged 16	-0.206	-0.141	-0.149	-0.105
Aged 17	-0.385	-0.338	-0.317	-0.228
Speaks another language and English well	n.s.	-0.035*	0.052	0.041
Speaks another language and English not well	-0.115	-0.171	n.s.	-0.085
Torres Strait Islander+	n.s.	0.032*	n.a.	n.a.
Born overseas	-0.064*	n.s.	0.007	n.s.
Parents born overseas	n.s.	0.029**	0.011	0.005
Moved between 1996 and 2001	n.s.	-0.043	-0.027	-0.033
Victoria	n.s.	0.034*	0.023	0.029
Queensland	n.s.	n.s.	-0.013	n.s.
South Australia	n.s.	0.035*	-0.008	0.006
Western Australia	-0.088	-0.064	-0.062	-0.047
Tasmania	0.051*	0.042*	n.s.	n.s.
Northern Territory	n.s.	-0.033**	n.s.	n.s.
Australian Capital Territory	0.132	0.076*	0.044	0.028
Inner regional	n.s.	0.028	n.s.	n.s.
Outer regional	n.s.	n.s.	0.004**	0.009
Remote	-0.080	n.s.	-0.028	n.s.
Very remote	-0.121	-0.069	-0.083	-0.013*
Single person household	n.s.	n.s.	-0.091	-0.123
Highest education in the household a degree	0.152	0.088	0.090	0.057
Highest education other qualification without Year 12	0.060	n.s.	0.027	0.013
Highest education other qualification with Year 12	0.130	0.056	0.066	0.040
Highest education Year 12 but no qualification	0.090	0.033	0.055	0.035
At least one adult with different Indigenous status	0.042	0.040	-0.087	-0.093
Extra person in the household	-0.006**	n.s.	-0.007	-0.001**
Child under 15 in the household	0.055	0.041	0.042	0.026
Extra person per bedroom	-0.035	-0.031	-0.032	-0.034
Household owns or purchasing home	0.091	0.067	0.050	0.037
Equivalised income of others in the household	0.017*	0.030	0.017	0.011
Probability of the base case	0.771	0.841	0.895	0.933
Pseudo R-squared	0.1791	0.1758	0.1692	0.1754
Number of observations	8,220	8,123	264,891	251,731

Source: Customised data from the 2001 Census. Coefficient estimates and p-values are given in Table 7A.1 and 7A.2

Base case: Aged 15; Speaks English only; born in Australia; both parents born in Australia; does not identify as a Torres Strait Islander; did not change usual residence between 1996 and 2001; lives in New South Wales; lives in a major city; no-one in the household has completed Year 12 or has a qualifications; no adults in the household of a different Indigenous status; no children under 15 in the household; lives in a four-person household with one person per bedroom; does not live in a household where someone owns or is renting the home; and the household has a equivalised income of $508.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level. +Includes those who identify as both Aboriginal and Torres Strait Islander.

There are a few differences between the above table and the results presented in Table 7.7. The effect of age, although still negative, has a somewhat smaller magnitude than when looking at high school education only. For Indigenous males, having moved areas is no longer associated with the probability of attending and for the other three groups, the magnitudes of the marginal effects are much smaller. This implies that either the education costs of migration are higher for those attending high school than those attending other education or that a large proportion of Indigenous males who are attending other education have had to move to do so.

For the Indigenous population, the negative association with being in a very remote area has a much larger association than it did with the probability of attending high school only. This is because in very remote areas there are even fewer non-school education options.

7.3 Results – Area-level characteristics factors associated with education attendance – 15 to 17-year-olds across Australia

The results in the previous section show that those in very remote and to a lesser extent remote Australia are less likely to be attending high school than those in cities and regional areas. However, other characteristics of the area are also likely to have an association, including characteristics of those who live in the area. The attendance and completion rates of one's peers and role models are likely to influence the relative social acceptance of attending or not attending high school. Furthermore, under the assumption of non-zero costs of migration or geographically constrained access to information, the economic incentives to undertake education as estimated on others in the area are likely to have an effect on whether a youth sees education as being worthwhile.

Despite a number of authors assuming that the explanation for low attendance at high school is influenced by the area in which a person lives, especially in remote Australia (for example, Johns 2006) there has been no research in Australia testing empirically whether this is the case. However, identifying those types of areas that are likely to have relatively low attendance will enable policies to be better targeted and provide some potential ways in which the motivation of Indigenous youths to attend school can be increased.

The results in this section look at the association between education and labour market characteristics of the area in which people live and their own participation in education. Results are presented separately for each of the four sets of area-level variables outlined previously, focussing on the marginal effects for these variables only. It should be kept in mind that the equations estimated still do contain the individual, household and geographical variables from the previous section, with full results given in the Appendix to this chapter.

The marginal effects in this section represent the predicted change in the probability of attending high school from a one standard deviation increase in that particular variable from its mean value whilst holding all other variables constant. The only exception to this is the presence of the CDEP scheme for which the marginal effect can be interpreted like any other binary variable. Different means and standard deviations are used for Indigenous and non-Indigenous males and females and are given in Tables 7.2 to 7.5.

7.3.1 Peer group effects

The presentation of the area-level results begins with the association between the proportion of the 15 to 17-year-old population in the area attending high school and an individual's own participation. That is, after controlling for the large set of individual, household and other geographical characteristics discussed earlier, does the decision of others in the area still have an association? The first peer group variable is the percentage of 15 to 17-year-olds in the area attending high school, the second the percentage attending other types of education. The association with the two dependent variables are presented in separate columns with a separate row for Indigenous and non-Indigenous males and females.

Table 7.9 Marginal effects on the probability of attending education – High school and other education peer effects

	High school student	Any student
Indigenous male		
High school peer effect	0.022	0.020
Other student peer effect	n.s.	0.011**
Indigenous female		
High school peer effect	0.026	0.020
Other student peer effect	0.010**	0.012*
Non-Indigenous male		
High school peer effect	0.032	0.028
Other student peer effect	n.s.	0.011
Non-Indigenous female		
High school peer effect	0.020	0.015
Other student peer effect	n.s.	0.007

Source: Customised calculations from the 2001 Census. The predicted probability of the base case, pseudo R-squared, sample size, coefficient estimates and p-values are given in Appendix Tables 7A.5 to 7A.8.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

Looking at the first column, the proportion of the population who are attending high school in the area has a significant and positive association with a person's own high school attendance for Indigenous and non-Indigenous males and females. The change in the predicted probability from a one standard deviation increase ranges from 0.020 to 0.032 which, although not large, is still higher than the association with a number of individual and household variables (for example, household income). Attendance in the area is also associated with a higher probability of the individual attending any education (in the second column) and for those who are students, the choice of high school over other education (the third column).

While it is a little difficult to interpret such a variable, at the very least it shows that characteristics of the area matter. That is, rather than geographical areas just being a collection of individuals influenced by their own or their household's characteristics, the results in Table 7.9 give some indication that characteristics of the area affect individual outcomes. It may also be the case that the either the individual's peers are having a direct effect or there may be some other unobserved characteristics affecting both individual and those around them. However, the results are certainly an indication that any policy response to relatively low attendance at high school needs to take into account geography.

Interestingly, the proportion of the population attending other education does not seem to have a significant negative association with whether or not the individual attends high school. Indeed, for Indigenous females, there is a small positive association. Furthermore, the other peer group effect is associated with a higher probability of attending any education. In other words, it would seem that having others in the area attending non-school education does not draw youths in the area away from high school, but rather draws its numbers from those that would not be attending any education.

7.3.2 Role model effects

Indigenous youth are not only likely to respond to the behaviour of those of the same age as them, they may also take into account the level of education of adults in the area. The next set of results look at the association between the predicted probability of attending education for 15 to 17-year-olds and the education attainment of two older cohorts of individuals. Once again, results are presented as the predicted change in the probability of the particular event occurring from a one standard deviation increase from the mean for the four role model variables.

Table 7.10	Marginal effects on the probability of attending education – Role model effects

	High school student	Any student
Indigenous male		
Percentage aged 18 to 29 completed Year 12	0.035	0.021
Percentage aged 30 and over completed Year 12	n.s.	n.s.
Percentage aged 18 to 29 with qualifications	-0.017*	n.s.
Percentage aged 30 and over with qualifications	0.042	0.042
Indigenous female		
Percentage aged 18 to 29 completed Year 12	0.035	0.025
Percentage aged 30 and over completed Year 12	n.s.	n.s.
Percentage aged 18 to 29 with qualifications	n.s.	0.011**
Percentage aged 30 and over with qualifications	n.s.	n.s.
Non-Indigenous male		
Percentage aged 18 to 29 completed Year 12	0.026	0.017
Percentage aged 30 and over completed Year 12	0.008	n.s.
Percentage aged 18 to 29 with qualifications	-0.002**	0.003*
Percentage aged 30 and over with qualifications	0.007	0.009
Non-Indigenous female		
Percentage aged 18 to 29 completed Year 12	0.019	0.012
Percentage aged 30 and over completed Year 12	0.005*	n.s.
Percentage aged 18 to 29 with qualifications	n.s.	n.s.
Percentage aged 30 and over with qualifications	0.004**	0.010

Source: Customised calculations from the 2001 Census. The predicted probability of the base case, pseudo R-squared, sample size, coefficient estimates and p-values are given in Appendix Tables 7A.9 to 7A.12.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

If there are a large proportion of 18 to 29-year-olds who have completed Year 12 in a given area, then both Indigenous and non-Indigenous youths are more likely to be attending high school. There is no association between the high school education levels of the older cohort and participation of Indigenous youth, and for the non-Indigenous population the magnitudes are quite small. This implies that youths respond to the level of high school completion of their nearest contemporaries, rather than older adults in the area.

The associations with the qualifications variables are, however, somewhat different. For Indigenous females, there is no significant association with either cohort. For males, however, having a high proportion of the population aged 30 years and over with qualifications is associated with a higher probability of attending high school. Given Chapter 2 showed that Indigenous Australians obtain their qualifications at relatively high rates in their 30s and beyond, this quite possibly reflects the expectation in these areas of completing high school as a prerequisite for post-school qualifications. Compared to this, living in an area with a high proportion of the population aged 18 to 29 with qualifications is associated with a lower probability of attending high school for males and Indigenous males in particular. This could reflect a socially acceptable and physically accessible alternative to high school that draws youths away from school.

Compared to the estimates on the probability of attending high school, for the probability of attending any education the marginal effect of the proportion of the population aged 18 to 29 who has completed qualifications is not significant for Indigenous males, and positive for Indigenous females. That is, a high level of qualifications in the area does not appear to take students away from any education, but rather affects the choice of the type of education.

7.4.3 Predicted benefits of education in the area

While Indigenous youth do not appear to be responding to the economic incentives to attend high school at the national level, it is important to see whether there is any response to locally estimated benefits of education. In addition to identifying an avenue of policy response to low education participation, it will also give some insight into the type of information that Indigenous and non-Indigenous youth use to estimate what the potential benefits of education might be.[72]

Table 7.11 presents the results for the association between education participation and the predicted employment and income employment benefits of education in the area. The marginal effects for the predicted benefits of education are once again from a one standard deviation increase from the mean. A variable for predicted employment or income for those who do not complete Year 12 is also included which can be interpreted

[72] In their analysis of the relationship between predicted income benefits of education and high school completion in the USA, Wilson, Wolfe and Haveman (2005) only use those aged 18 to 29 to calculate returns in the area. Due to low numbers of Indigenous Australians in a number of areas, this was not feasible for Indigenous estimates. However, results for the non-Indigenous population did not change using this reduced age group. This is most likely because future income is discounted in the estimates for benefits in the area so those aged 18 to 29 already explicitly carry more weight.

as both the general level of economic activity in the area, as well as the outcomes that a person might compare the predicted benefits against.

Table 7.11 Marginal effects on the probability of attending education – Predicted employment benefits

	High school student	Any student
Employment benefit of high school		
Indigenous male		
Employment if not completed high school	n.s.	n.s.
Employment benefit of high school	n.s.	n.s.
Indigenous female		
Employment if not completed high school	0.015	n.s.
Employment benefit of high school	0.018	0.011*
Non-Indigenous male		
Employment if not completed high school	0.021	0.018
Employment benefit of high school	0.017	0.015
Non-Indigenous female		
Employment if not completed high school	0.013	0.010
Employment benefit of high school	0.007	0.006
Income benefit of high school – Employed		
Indigenous male		
Income if not completed high school – Employed	0.019*	0.033
Income benefit of high school – Employed	n.s.	n.s.
Indigenous female		
Income if not completed high school – Employed	0.042	0.034
Income benefit of high school – Employed	n.s.	n.s.
Non-Indigenous male		
Income if not completed high school – Employed	0.013	0.013
Income benefit of high school – Employed	0.021	0.016
Non-Indigenous female		
Income if not completed high school – Employed	0.007	0.005
Income benefit of high school – Employed	0.012	0.010

Source: Customised calculations from the 2001 Census. The predicted probability of the base case, pseudo R-squared, sample size, coefficient estimates and p-values are given in Appendix Tables 7A.13 to 7A.20.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

For Indigenous males, neither the predicted employment benefits of education nor the predicted level of employment for those that do not complete Year 12 are significantly associated with high school attendance or attendance in other education. For Indigenous females and non-Indigenous males, however, both variables are significant, positive and have a reasonably large marginal effect. That is, both these groups appear to respond to the employment incentives in the area when deciding whether to undertake high school or not. The associations for non-Indigenous females are also positive; however, the magnitude of the marginal effects are quite small. The association with attendance at any education is generally smaller and there is also a small positive association with the choice of the type of education.

For the Indigenous population, the predicted level of income in the area has a large association with an individual's participation; however, the difference in predicted income between those who complete Year 12 and those that do not is not significant. For the non-Indigenous population in general and non-Indigenous males in particular, the predicted income benefit of education does have a strong positive association.

The first implication of these results is that, for Indigenous females at least, the capabilities approach is somewhat supported in that the effect of education on the ability to obtain employment seems to be have a bigger association with participation than the effect of education on income. There may be other reasons why Indigenous Australians do not respond to the income benefits of education estimated at the local level. It may be a measurement issue in that, because of relatively small numbers within each area, Indigenous Australians do not feel that looking at those around them is the best indication of what the income benefits of education might be. Alternatively, the motivation to obtain higher incomes may be weaker amongst the Indigenous population if that income must be shared across larger families or social networks.

An alternative explanation for why areas with high predicted income benefits are not associated with higher participation in education for the Indigenous populations is that the unobserved costs (social, transport, etc.) in the area may be blunting the economic incentives. In Section 3.4 a model was outlined where a high unobserved cost of education leads to a lower proportion of the population attending high school but higher predicted benefits of education (because it is only those with high levels of ability who are able to attend). Those areas with high unobserved costs of education might therefore be balancing those areas where the income incentives to complete Year 12 are inducing Indigenous Australians to continue on at school, leaving a net effect that is not significantly different from zero.

7.3.4 Presence and level of participation in the CDEP scheme

One labour market program that may influence the social and economic incentives to complete high school is the CDEP scheme. The next set of results looks at the association between CDEP employment in the area and education participation. Two variables are included, where the first captures whether or not there is anyone in the area working in the CDEP scheme and the second the proportion of the ERP of Indigenous Australians who are doing so.

Table 7.12 Marginal effects on the probability of attending education – CDEP effects

	High school student	Any student
Indigenous male		
Presence of the CDEP scheme in the area	-0.037*	-0.040
Percent of ERP employed in the CDEP scheme	n.s.	n.s.
Indigenous female		
Presence of the CDEP scheme in the area	-0.036	-0.032
Percent of ERP employed in the CDEP scheme	n.s.	n.s.
Non-Indigenous male		
Presence of the CDEP scheme in the area	n.s.	n.s.
Percent of ERP employed in the CDEP scheme	0.003	0.003
Non-Indigenous female		
Presence of the CDEP scheme in the area	-0.011	-0.009
Percent of ERP employed in the CDEP scheme	0.004	0.003

Source: Customised calculations from the 2001 Census. The predicted probability of the base case, pseudo R-squared, sample size, coefficient estimates and p-values are given in Appendix Tables 7A.21 to 7A.24.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

Those individuals in areas with a CDEP scheme have a predicted probability of attendance significantly less than those without a CDEP scheme. Given these results are after controlling for remoteness and the effect for the non-Indigenous population is substantially smaller (and not significant for males), they are likely to be related the CDEP scheme itself, rather than something about the areas in which the CDEP scheme operates. The CDEP scheme may be influencing either the social or economic incentives to complete Year 12 by providing an alternative to undertaking education. That the variables are, significant for all Indigenous students implies that this effects participation in all types of education, rather than just high school.[73]

Despite an increase in the geographical range of the CDEP scheme since its inception, there are quite different rates of participation in the CDEP scheme across Australia (Hunter 2003). Furthermore, recent and forthcoming changes to the scheme will likely change the focus back to remote areas (DEWR 2006). This means that not only do those in regional areas and major cities have more non-CDEP employment options, increasingly places on the CDEP scheme will no longer be available. Hence, the relationship between the CDEP scheme and high school participation might be quite different across Australia.

The possibility that the association between the CDEP scheme and high school participation was different in different parts of Australia was tested by undertaking three separate estimates. The first is in major cities, the second in regional areas and the third in remote and very remote Australia. The marginal effects for these estimations (for the Indigenous population only) are given in the following table.

Table 7.13 Marginal effects on the probability of attending education – CDEP effects by remoteness

	Major city	Regional area	Remote area
Indigenous male			
Presence of the CDEP scheme in the area	n.s.	n.s.	-0.099*
Percent of ERP employed in the CDEP scheme	n.s.	-0.025**	n.s.
Indigenous female			
Presence of the CDEP scheme in the area	n.s.	n.s.	n.s.
Percent of ERP employed in the CDEP scheme	-0.038**	-0.033	0.017

Source: Customised calculations from the 2001 Census. The predicted probability of the base case, pseudo R-squared, sample size, coefficient estimates and p-values are given in Appendix Tables 7A.25 to 7A.27.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

73 It should also be kept in mind that the provision of the CDEP scheme is in part a choice made by governments. Although there are likely to be historical reasons for there being a CDEP scheme in the area, Biddle and Hunter (2006b) showed that there was a fair degree of change through time. This being the case, CDEP schemes may therefore be set up in areas partly because of factors also related to low attendance, rather than the CDEP scheme causing low attendance. For example, the CDEP scheme may be more common in areas with a greater attachment to a traditional lifestyle which may also be related to formal education being seen as less relevant.

The way in which the CDEP scheme is associated with attendance varies for Indigenous males. In regional areas, it is the proportion of the population employed in the scheme that is significant, whereas in remote areas it is the presence of the scheme itself. Nonetheless, for Indigenous males in both types of areas the CDEP scheme is in some way associated with a lower probability of attending high school. Interestingly, for Indigenous females, those remote areas with a high proportion of the population employed in the CDEP scheme are associated with a higher probability of attending high school. That would suggest that any policy responses to the overall finding that the CDEP scheme is associated with lower attendance must take into account the particular effect it has in different areas.

7.4 The factors associated with high school participation – Discussion and implications

Despite the substantial economic and health benefits of education outlined in the previous chapters, Indigenous Australians are less likely to be attending high school than the non-Indigenous population. In order to understand why Indigenous Australians do not appear to be responding to the economic incentives and what barriers there might be to attending and completing high school, this chapter looked at some of the individual, household and area-level factors associated with education participation of in Australia.

The remainder of this chapter summarises the association these variables were found to have with high school attendance. Before then though, it should be noted that even after controlling for a range of observable characteristics, the probability of an Indigenous youth attending high school was always less than the probability of the corresponding non-Indigenous youth (estimated at the base case). Therefore, there are still unobserved characteristics specific to Indigenous youth or influences on their behaviour that contribute to lower levels of attendance. Some possible unobserved factors are discussed in Chapter 8 and strategies to identify other variables are given in Chapter 9.

7.4.1 The individual and their household

The type of household in which an Indigenous youth lives is clearly associated with the probability of them attending high school. Education levels in their household generally had a significant association with a youth's probability of attending high school, especially for Indigenous males. However, the type of education is important with those living in households where someone has a degree having the highest probability, followed by those households where someone has completed Year 12. Other non-school qualifications are significant, but the magnitude of the effect is smaller.

Although it is not possible to measure causality with cross-sectional data, the results do imply that any improvements to the education levels of adult Indigenous Australians could conceivably lead to additional improvements in education participation of Indigenous youth. Looking at this in another way, those youths in households with lower levels of education may be particularly in need of support from their school and community in overcoming the potential social costs of education.

This chapter has shown that it is not the number of people in the household that is significantly associated with attendance, but the number of people per bedroom. This implies that it is overcrowding which reduces education participation, rather than large households. Home ownership and household (equivalised) income, had a significant and positive association with attendance. Efforts to improve these three aspects of Indigenous households may therefore also have additional effects on high school participation.

Those who were reported to not speak English well or not at all were significantly less likely to be attending high school. This is an indication that those with different language skills from the rest of the population may not have access to schools that meet their needs and find it difficult in standard schools. In addition, while this is a weak proxy, the results give some support for the possibility raised in Chapter 3 that youth with lower levels of cognitive and non-cognitive ability are less likely to attend and complete high school.

Almost as interesting as the variables that were significant, the finding that those males who identify as Torres Strait Islanders (or both Aboriginal and Torres Strait Islander) did not have a statistically significant difference in their probability of attending high school also has important policy implications. Importantly, it shows that once other individual and household factors are controlled for, Torres Strait Islanders are also less likely to attend high school than the non-Indigenous population and hence any policy designed to improved Indigenous participation in high school must also include this group.

7.4.2 The importance of geography in explaining Indigenous high school participation

Ultimately, there is still a large difference in the probability of attending high school between Indigenous and non-Indigenous Australians after controlling for a large set of household and individual characteristics. The ongoing effects of culture and history outlined in Schwab (1999) and the particular incentives to complete high school found in earlier chapters therefore remain key potential explanations for low levels of high school participation. Aspects of these social and economic factors are captured through the unique geographic distribution of Indigenous youth.

Two types of geographic variables were used in this chapter. The first type was physical and jurisdictional characteristics of the region of a person's usual residence. This was measured by the state and territory in which a person lived as well as the remoteness classification of the region. The results presented in Table 7.7 show that those whose usual residence is in remote and very remote areas are less likely to be attending high school than those in major cities. However, the differences in predicted probabilities from the models were much less than the difference in unadjusted proportions, and were not always significant for females. This suggests that a large part of the gap in high school attendance in remote and very remote areas is because of the differences in the distribution of individual and household variables.

State variables also had an association. Although these associations were generally consistent across the Indigenous and non-Indigenous estimations, the positive marginal effects for the Indigenous populations in South Australia and Queensland were larger in magnitude than for the non-Indigenous estimations. This may be because these states are doing relatively well at reducing the gap in Indigenous attendance.

The second type of geographic variable captured more specific aspects of the people in the area the person lived, as well as the local labour market. These variables are often referred to as neighbourhood effects in the economic literature. The first of these variables used was the proportion of the rest of the 15 to 17-year-old population in the area attending high school. For Indigenous and non-Indigenous males and females, this variable was positively associated with the predicted probability of an individual attending high school. This shows that area-level characteristics do matter when it comes to explaining individual attendance. Importantly, the results also showed that encouraging those who were not high school students to attend non-school education did not seem to draw others in the area away from high school.

The second set of neighbourhood variables captures the education levels of two older cohorts of individuals. For Indigenous and non-Indigenous males and females, the proportion of the population aged 18 to 29 who had completed high school had a positive association with the attendance of a 15 to 17-year-old in the area. This shows that increasing the proportion of one cohort of individuals who complete high school has flow-on effects to subsequent cohorts.

While the above result has implications into the future, it is not very realistic to expect that adults will go back to high school in large numbers and hence there are fewer policy implications from this variable with regards to improving the attendance rate of those who are currently 15 to 17-years-old. However, it is easier to increase the proportion of adults who have post-school qualifications. For Indigenous females, the two variables capturing post-school qualifications were not significant. For Indigenous males on the other hand, both variables were significant but had opposite signs.

Youths in areas with high levels of 18 to 29-year-olds who had completed qualifications had a lower probability of attending high school, showing that there is a potential for non-school options to draw youths away from school. However, this variable did not have a significant association with the probability of being any type of student (high school or non-school) which implies that it is the choice between types of education, not the choice of whether to undertake education that is affected. Furthermore, the variable was only significant for those aged 17 and actually had a positive association for those in remote and very remote areas.

In general, there is a fair degree of consistency between the association with the peer group and role model area-level characteristics and individual participation across the Indigenous and non-Indigenous estimations. The major exception to this was the marginal effect of the percentage of the population aged 30 years and over with qualifications which was significant for Indigenous males but not significant for Indigenous females and quite small for the non-Indigenous population. In addition to any returns to post-school qualifications for the adults themselves, encouraging or supporting Indigenous males aged 30 years and over to obtain qualifications may therefore have the additional effect of highlighting the benefits of school and non-school education to male youths in the area. That is, it may help encourage a culture in the area of seeing education as worthwhile and, perhaps more importantly, obtainable.

The predicted employment benefits of education in the area had a significant positive association with high school attendance for Indigenous females, though not for Indigenous males. The variability with which these were estimated due to the small numbers of Indigenous Australians in many areas is likely to be an explanation for these inconclusive results for the Indigenous population. However, it may also be because the social and other costs of education discussed in Chapter 3 are dominating the response to economic incentives. That is, while non-Indigenous Australians appear to be able to weigh up the economic costs and benefits of high school when making their decisions, for the Indigenous population there appears to be too many other constraints that are getting in the way of them making what might otherwise be an economically valid decision to attend school.

The final set of neighbourhood variables showed that those youths who live in an area with a CDEP scheme operating in it are less likely to be attending high school than those who live in areas without the scheme. This was true for both Indigenous males and females, whereas the magnitude of the association with non-Indigenous participation was quite small. Because of the changes to the CDEP scheme proposed in DEWR (2005; 2006) and discussed earlier in this thesis, any future policy responses to these results should focus on those given in Table 7.13 which looked at variation by remoteness. In particular, given the CDEP scheme is likely to become an increasingly remote area program, the final column in that table is of most relevance.

For remote areas, the association with the CDEP scheme is somewhat mixed. For males, there is a relatively large negative association with the presence of the CDEP scheme showing that the potential social and economic disincentives from the scheme with regards to completing high school should not be discounted. For females, however, there is no significant association with having a scheme in the area and furthermore, there is actually a positive association with the proportion of the estimated resident population employed in the scheme. While it is not surprising that the effect of the CDEP scheme seems to be largest for males (Biddle and Webster 2007 showed that males were more likely to be employed in the scheme), the positive result for females shows that the community development aspects of the scheme may be important in counter-balancing any incentives from the scheme to leave school early.

In thinking about the implications of the area-level results for policy formulation, it is important to keep in mind that Table 7.7 shows that those Indigenous and non-Indigenous youth who moved areas in the five years preceding the Census were found to have a lower probability of attending high school than those who did not. This may be because those who would otherwise decide not to attend high school because of unobservable characteristics have lower costs of moving and are therefore more likely to move.

However, the result gives some evidence that those who do move face disruption to their schooling and higher social costs in their new location and at the very least, there is evidence for there needing to be extra support for students who do move to new areas. Furthermore, any policy that is designed to encourage migration as a way to improve attendance (for example, Brough 2006) must take into account the potential costs of moving alongside any potential benefits of a youth moving out of an area associated with lower participation.

Chapter 8 The development of cognitive and non-cognitive ability: Preschool and non-government school attendance

Earlier chapters in this thesis show that the predicted economic benefits of high school education for Indigenous Australians are not only quite high, but often exceed those of the non-Indigenous population. However, that the proportion of the current population attending high school remains below that of the non-Indigenous population shows that at the national level, there are impediments to taking advantage of the many benefits that education has to offer.

There are a number of factors that are therefore clearly influencing high school attendance for the Indigenous population. The previous chapter identified a number of these including: individual and household factors; peer and role model effects; and the presence of the CDEP scheme in the area. One factor that was not included in the model was a person's cognitive and non-cognitive ability. This is not because it is unlikely to be important, as Chapter 3 outlined a number of ways in which ability is likely to influence the benefits of and participation in high school education and several studies have confirmed this relationship empirically. Rather, ability was not included in the estimations because neither the Census nor any large data set on Indigenous Australians has adequate measures of ability which can be compared against the probability of attending high school.

While it is unlikely that the distribution of natural ability across the Indigenous population is any different to the distribution for the non-Indigenous population, by the time a person reaches late secondary school there a number of external factors that are likely to have had an impact. Some of these may have been captured by the individual and household variables in the estimations presented in Chapter 7; however, other factors like the quality of early schooling are unlikely to have been fully controlled for.

Three components of early schooling that are likely to influence a person's ability by the time they reach late secondary school are how prepared they were on entry into formal schooling, the amount of resources that were devoted to their education and the characteristics of a student's peers. This last possibility was covered in the previous chapter and, even though there is no retrospective information on the experiences of those aged 15 to 17-years-old at the time of the Census, some information related to the first two issues is available for those currently of preschool and school age. This chapter looks at two aspects of early school experience that might be related to the development of cognitive and non-cognitive ability, preschool attendance and attendance in non-government schools.

Preschool, as a form of early childhood education, is one possible way in which the cognitive and non-cognitive ability of Indigenous Australians can be improved throughout later years of schooling.[74] It can do so by making a person more ready for the transition to school and can also provide a boost to a child's confidence and self-esteem. In Australia, attendance at preschool is not compulsory and there is often a fee involved in doing so. This is likely to lead to variation in preschool attendance amongst eligible Australian children. Motivation of families to send their children to preschool may vary, especially if the quality of preschool across Australia also varies.

The first set of empirical results presented in this chapter looks at the factors associated with preschool attendance for 3 to 5-year-olds. Doing so gives insight into some of the unexplained variation in the patterns of attendance in late secondary school found in Chapter 7 and more importantly shows how attendance at high school can possibly be increased for future generations.[75]

---

[74] For this thesis, preschool is defined (following ABS 2003b) as educational and developmental programs for children in the year (or in some jurisdictions, two years) before they begin full-time primary education. Preschool generally caters to children aged 3-5 years and are usually open only during school terms and usually between 9 am and 3 pm.

[75] Preschool education could also have both positive and negative effects on a child's physical health. Leading to poorer health, attendance at preschool may expose a child to a greater number of potential infectious diseases. Ferson (1997) reported that children attending childcare centres and preschools had both a greater number of infections and more days of illness than children cared for at home. The difference was greater for younger children. For a child attending preschool, however, there are likely to also be a number of positive effects on their health. Not only is long-term health likely to be improved through the effect preschool has on cognitive development and academic achievement (see Masse and Barnett 2002 for a calculation of the effect on smoking) there are also likely to be direct, immediate effects. For example, nutritional or general health knowledge might be improved at preschool (Hendricks, Echols and Nelson

The type of school that a person attends once they begin school and beyond is also likely to impact on the development of their cognitive and non-cognitive ability. A large number of factors influence the quality of the schooling that a person receives. These include the appropriateness of the curriculum, the skills and commitment of a student's teachers and the characteristics their peers. The level of resources that are devoted to their schooling may also influence the quality that they receive. Furthermore, there is evidence that for those at the bottom of the distribution of school attendance, that is those whose family and household circumstances would predict a low probability of attending, increased expenditure as measured by student-teacher ratios has a particularly favourable effect on outcomes (Eide and Showalter 1998).

One factor that may influence the type of education that a person receives is which one of a government school, Catholic school or other non-government school a student attends. This is because, in Australia the resources devoted to students in non-government schools, including contributions from governments and parents/guardians are on average higher than those in government schools (Le and Miller 2003).

The Cape York Institute (CYI) has in place a program that supports selected remote Indigenous students to attend non-government boarding schools in major cities as one way of improving education outcomes (CYI 2006). There are a number of attractive features of such a program; however, it could not be implemented on a large scale without a number of financial or opportunity costs. Furthermore, the potential externalities for those who remain in the communities should not be discounted. A more detailed discussion of the proposals of the CYI is given in the Section 8.5; however, to support such an analysis this chapter looks at some of the factors associated with attendance at non-government as opposed to government schools.

1989) and for children at risk, identification and treatment of potential physical and mental health problems may be better than if the child was kept at home. Understanding who is and who is not attending preschool may help identify those children who may have such health risks.

By looking at the factors associated with non-government school attendance, insight will be gained into who may currently be benefiting from non-government schooling, as well as those who may potentially benefit in the future. In addition, the role of non-government school attendance in explaining some of the results found in Chapter 7 will also be partially tested.

The remainder of this chapter is structured as follows. Section 8.1 outlines the method used to look at the factors associated with preschool attendance, whereas Section 8.2 presents the results from the analysis. Section 8.3 looks at the methods for estimating the factors associated with non-government school attendance and Section 8.4 the results. Finally, Section 8.5 provides a summary of the main results from this chapter.

8.1 Analysing the factors associated with preschool attendance – Background and method

This section sets up the analysis of the factors associated with preschool attendance. It begins with a brief discussion of the history of preschool education in Australia, then outlines some previous research looking at what type of children attend preschool. The final part of the section outlines the model and estimation method for the analysis of preschool attendance in this chapter.

8.1.1 History of preschool education in Australia

For Indigenous Australians early childhood education was always an important part of a child's development and occurred as part of both formal and informal education systems. This occurred outside a Western-style classroom setting. Informally, children watched how their parents and other family members behaved and learnt from them through imitation and instruction. But there were also formal education structures where young Indigenous children learnt the ceremonial, mythological, social and economic skills needed to live their lives (Teasdale and Whitelaw 1981).

From the early stages of colonisation, publicly provided early childhood care (as there was not much education) was focused on the poor, culminating in the last three decades of the 19th Century with the 'child-rescue movement' which saw as its aim the removal of children from what were seen as bad or dangerous home environments. This was no more apparent than for Aboriginal children. According to Mellor (1990) during the second half of the nineteenth century there were two types of services for Aboriginal children:

> On the one hand, there were the very limited schooling and health provisions for those children who lived on reserves and who were expected to die out with the rest of their tribe. On the other hand there were the schools and health services designed to ensure that children of mixed parentage adopted a European way of life as quickly as possible – Mellor (1990)

That is, segregation for those who were part of the 'dying race' and protection for those who could be expected to be successfully civilised. Here, McConnochie and Russell (1982) point out the close relationship between wider government policies and attitudes towards the Indigenous population and more specific education policies and practices. The authors also outline three broad phases of preschool policy throughout the history of Indigenous/non-Indigenous interaction up until the 1960s. The first, up until the 1860s, was one of 'civilising and chistianising.' The second, from the 1870s to 1940s, was one of segregation and protection. This period roughly coincided with a split into two strands of kindergarten development within the major cities (mainly for non-Indigenous children). One strand was developed within infants' classes in primary schools, the second within the 'free kindergartens' which were more likely to be outside the school system (Mellor 1990).

The third shift in Indigenous preschool policy, around the late 1930s and 1940s, saw a return to an emphasis on assimilation and the use of 'wardship and tutelage.' Throughout this time, most Indigenous preschool and other education policies were largely unsuccessful. According to Teasdale and Whitelaw (1981) this reflects not only a general lack of funds and resources, but perhaps more importantly, the European-orientated syllabus and practices that for the most part did not try to incorporate Indigenous knowledge and differences.

Since the 1960s there have been major changes in Indigenous early childhood education. These changes have resulted in part from the 1967 referendum, which granted powers to the Commonwealth Government to legislate on behalf of Indigenous Australians (Teasdale and Whitelaw 1981). However, the changes also occurred alongside more general changes in early childhood education, especially stemming from North American writings as well as a gradual, though not uninterrupted, move towards multiculturalism in Australia. Taken together, this led to greater involvement of the Commonwealth Government in supporting preschool for Indigenous children as well as a greater recognition (if not always successful implementation) of the role of Indigenous Australians in preschool education and taking into account and learning from the unique culture that Indigenous children bring to their education.

Although always an issue, with an increased proportion since the 1960s and 1970s of women in the labour force, the role of preschool as a form of care and supervision for the children of working mothers has become more prominent. According to Press and Hayes (2000), the location of the *Child Care Act* which governs federal involvement in early childhood education and care in the Department of Family and Community Services as opposed to the Department of Education Science and Training reflects the view of it being related to issues of employment and family support as opposed to education (which is seen as a State government responsibility).

Currently, in Australia the responsibility for the early years of childhood education is spread across federal, state and local governments. The Commonwealth Government's role in preschool is mainly confined to specialist programs for Indigenous Australians. This funding occurs as part of the Indigenous Education Strategic Initiatives Programme and is largely outside the State government or Catholic systems. In 2003, an estimated \$11.2m in supplementary funding was provided to education providers. This represented 7,644 full-time equivalent preschool Indigenous enrolments (DEST 2005).

In addition to preschool, many children experience other forms of formal or informal care prior to and concurrently with attendance at preschool. Some form of education is likely to occur during this care. Furthermore, although preschool is often thought of as primarily educational in nature, a number of parents or guardians are likely to use preschool at least in part as a form of care and supervision for their children. Unfortunately, there are no surveys in Australia with a large enough sample to obtain information on the use of these other forms of early childhood education and care by Indigenous Australians. Nonetheless, the Child Care Survey, carried out most recently by the ABS in 2002, does have information on formal and informal care used by the population as a whole.

According to ABS (2003b) 3-years-olds are more likely to attend some form of formal care, rather than no care at all. However, of this formal care, more children attend long day care centres (which have less of an emphasis on education programs) than preschool. 4-year-olds, on the other hand, are much more likely to attend preschool than long day-care centres, with the majority of 5-year-olds not attending any formal or informal care (because they are at infants/primary school).

8.1.2 Past research on the factors associated with attendance

There is very little research in Australia on how attendance at preschool varies by the characteristics of the child. Furthermore, the information available is mainly descriptive and, to the author's knowledge at least, there is no research focussing on Indigenous children. Although a focus on outcomes of preschool is not surprising, it is still important to know what type of students are attending, taking the outcomes as given. This is especially the case for small population subgroups for whom no other information is available. The research that is available suggests that socioeconomic characteristics of the family and household have a strong influence on preschool attendance.

In the USA, Bainbridge et.al (2005) report lower enrolment in pre-primary education by ethnic background (Hispanic children had lower attendance than white non-Hispanic children who, in turn, had lower attendance than black children), income and parental education. These differences were found in both descriptive and multivariate analysis. The authors, however, did find substantial change through time in the association income has with enrolment, although the direction of the change is different for different ages. For 3-year-olds, the gap in enrolment associated with income increased over the study period (1968 to 2000), whereas for 4-year-olds the gap narrowed somewhat, and for 5-year-olds it was almost completely eliminated.

Public policy also makes a difference. Cappizzano, Adams and Sonenstein (2000) found differences in attendance rates by the state in which the child lived (once again in the USA). Furthermore, Magnuson, Meyers and Waldfogel (2007) looked at variation in increases in public funding of pre-primary education and found that such increases were the main reason for decreases in the gaps in enrolment between high and low income families.

Similar patterns by income and education were reported for Australia in ABS (2004c). That is, for all 4-year-olds in 2001, attendance was higher for those who lived in a household in the higher income quintiles and was also higher with increased parental education. Furthermore, speaking a language other than English at home was reported to lower the probability of attending preschool. Indigenous Australians were reported to be less likely to attend preschool, however the extent of the difference varied by age and remoteness.

An additional factor that has been reported to influence the likelihood of Indigenous children attending preschool is the 'cultural sensitivity' of the teaching methods and content. Furthermore, according to MCEETYA (2001) 'Well established personal relationships and a climate which is 'culture-friendly' are likely to have a significant positive impact on the use of early childhood education centres by Indigenous parents/carers.' DEST (2003) reported that comments from preschools with significant

Indigenous control confirmed that the most effective way to include Indigenous people in the preschool education of their children is through partnerships with parents/carers and family members as opposed to involvement on school boards and committees.

8.1.3 Factors associated with preschool attendance – Model specification

The dependent variable used in this part of the thesis is whether a child aged 3, 4 or 5 years old is currently attending preschool. Those who had already started school were excluded from the analysis.[76] It should be noted that, although the ABS has reasonably strict definitions about what constitutes preschool as opposed to long day-care, on the Census questionnaire this distinction is left to a certain extent to the household respondent. Hence there is a chance that a small proportion of children who are classified as attending preschool may in fact be in long day-care and *vice versa*.

Of the independent variables assumed to influence preschool attendance, the individual variables attempt to capture the characteristics unique to that person that may be associated with the decision by the parent or guardian to send that child to preschool. Firstly, boys and girls may differ in their probability of attending. For example, one sex may be assumed to be on average better suited to formal versus informal instruction. The second individual variable that is used is age. As the effect of age on readiness and need for preschool is likely to be strong and the associations with other characteristics are likely to vary by age, for the main estimations, models are estimated separately for 3, 4 and 5-year-olds.

The next variable, born overseas, may have an impact because of variation in cultural background which is likely to be particularly acute given the young age of the population and therefore a small amount of time since migration. The other migration variable measures whether at least one of the child's parents were born overseas. This variable is

[76] A joint analysis of preschool and school attendance was not considered appropriate as, although there is some discretion from parents/guardians, a large part of the decision to get their children to start school in most states is month of birth which, in 2001, was not available on the Census.

included so as to capture the possibility that parents who were born overseas may vary in their beliefs in and need for preschool education for their children.

The family-level variables used in this part of the analysis capture the variation in relative demand for preschool education. In selecting these variables, it is assumed that family-level characteristics affect the desire to send preschool age children in the family to preschool because of the belief in the efficacy of preschool.[77]

The first set of family-level variables used is the education level within the family. The base case is a family where at least one member has completed Year 12 but none have completed a university degree. Two variables are then set up for a) when no-one in the family has completed Year 12 (or a degree) and b) where at least one member of the family has a degree or higher. By measuring the past educational experience of individuals in the family, these variables capture to a certain extent the relative belief in education as a positive experience. That is, those who have completed Year 12 or obtained a degree are more likely to see formal education as a worthwhile endeavour or alternatively are more likely to have had at least some positive experiences in education in the past. That is, according to Schwab and Sutherland (2003, p.56) 'as a result of unsuccessful past engagements with education, many parents are ill-equipped to provide assistance and direction in their children's education.'

The other family-level variable used in the analysis measures the presence of other children. For this type of variable, the base case is a family where there are no other children 5 years or under not at infants or primary school. The alternate is at least one other person in the family of that age not at school. This variable captures the fact that having other children in the family who require some form of care (perhaps through

[77] In the rest of the analysis in this thesis, household rather than family-level variables were used to capture education levels. However, because preschool students are much younger it was felt that the family level was more appropriate. Robustness checks using household-level variables instead did not have a qualitative effect on the conclusions

preschool) may influence the desire for preschool through increasing the overall cost or burden for the family, albeit with the possibility of economies of scale.[78]

The household variables used in this part of the thesis measure access to economic resources. Although a number of households in Australia are able to send their children to a certain number of hours of preschool without any cost, this option is not available to all individuals and furthermore there are usually limits on the number of hours available. There is also the possibility of additional costs involved with sending children to preschool, including transport and equipment costs. For these reasons, attendance at preschool is likely to impose a drain on resources within the household and, as such, access to resources may affect preschool attendance. The variable available on the Census that best captures access to economic resources is income and in this section household equivalised income is once again used. However, rather than using a linear income variable like in the previous chapter, to explicitly take into account potential nonlinearity, income quintiles are used. Children whose household income is in the third quintile are used as the base case with a set of variables capturing whether they are in one of the other four quintiles.

State governments have substantial input into the construction of preschool policy in Australia. As such, the state or territory in which a child lives is likely to influence the decision of whether or not to send a child to preschool. Those who live in New South Wales are set up as the base case, with a separate variable used for the remaining seven states or territories. These variables are likely to capture the direct effect of differences in education policy, as well as other things more intrinsic to the states or territories.

[78] The original equations included a variable for whether or not everyone in the household was working or studying full-time (i.e. not able to look after a child full-time). However, the vast majority of families of preschool age children had at least one person (aged 15 and over) either not working or studying at all or doing so part-time. Furthermore, given the availability and choice of using preschool is in many ways jointly determined with working full-time, for simplicity these variables were left out of the final equations. Including these variables did not change the conclusions regarding any of the other independent variables apart from the presence of other children in the family (results are available from the author upon request). With the employment variables included, the coefficient for having other children in the family was significant; however, in the final results, the variable was found to be insignificant.

To capture geographical access to preschool the remoteness of the area that the child lives is used. Major cities are again the base case with a separate variable for the other four categories. The remoteness variables capture two aspects of isolation. The first is the time required to travel to attend preschool. That is, if there are no preschools within a reasonable distance for the child to attend, then it is unlikely that they will do so. The second aspect of isolation is the different types of community structure. Communities or neighbourhoods that are further away from major cities are likely to differ in the way in which they educate and care for their children.

Indigenous children are more likely to go to preschools which are sensitive to their unique needs. It would be preferable to have a variable that directly captures such Indigenous specific programs. Unfortunately, such a variable is not available on the Census. The final community-level variable may, however, capture such an effect to a certain extent. This variable measures whether or not there is a preschool worker who reported that they worked in a given area and who identified as being Indigenous. It is assumed that the presence of Indigenous teachers makes the parents of Indigenous children more comfortable that their child will receive a culturally appropriate education.

This variable could also be seen as an indication of the effect Indigenous learning communities might have on preschool attendance in those areas, as outlined in Schwab and Sutherland (2003, p.57). That is, an Indigenous presence in the preschool may go some way to counter the feeling that schools have in the past been ‘agents of disempowerment, and dismantlers of cultures and traditions.’ A variable is also included that measures whether or not there are any preschool workers in the area. This last variable is included to make sure the Indigenous preschool worker variable is capturing the Indigenous aspect only.

The variables that are used in this part of the thesis are given in the following table (with those used as the base case given in *italics*), alongside the proportion of the Indigenous and non-Indigenous population in the sample who report that particular characteristic.

Table 8.1 Proportion of the population with each characteristic, Indigenous and non-Indigenous 3 to 5-year-olds

Variable name	Indigenous proportion	Non-Indigenous proportion
Attending preschool	0.411	0.491
Aged 3	0.403	0.412
Aged 4	0.386	0.402
Aged 5	0.211	0.186
Female	0.490	0.480
Male	*0.510*	*0.520*
Born overseas	0.036	0.068
Born in Australia	0.964	0.932
At least one parent born overseas	0.060	0.323
Both parents born in Australia	*0.940*	*0.673*
Someone in the family has a degree	0.045	0.247
No-one in the family has finished Year 12	0.718	0.391
At least one person in the family has completed Year 12 (but none have a degree)	*0.237*	*0.362*
One or more child aged 0 to 5[79]	0.415	0.403
No other children in family aged 0 to 5	*0.585*	*0.597*
Household income in the bottom quintile	0.477	0.189
Household income in the second quintile	0.256	0.197
Household in the third quintile	*0.132*	*0.203*
Household income in the fourth quintile	0.083	0.205
Household income in the highest quintile	0.052	0.206
New South Wales	*0.282*	*0.322*
Victoria	0.060	0.255
Queensland	0.308	0.213
South Australia	0.048	0.096
Western Australia	0.137	0.067
Tasmania	0.035	0.022
Northern Territory	0.121	0.008
Australian Capital Territory	0.009	0.017
Lives in a major city	*0.296*	*0.644*
Lives in inner regional area	0.215	0.222
Lives in outer regional area	0.229	0.110
Lives in remote area	0.076	0.018
Lives in very remote area	0.184	0.006
At least one preschool worker working in the area who is Indigenous	0.275	0.170
No preschool worker working in the area who is Indigenous	*0.725*	*0.830*
At least one preschool worker working in the area	0.895	0.962
No preschool worker working in the area	*0.105*	*0.038*
Sample size	19,823	466,717

Source: Customised data from the 2001 Census.

Two separate specifications are used to look at the factors associated with preschool attendance. For the first specification, Indigenous and non-Indigenous children are included in the same estimation with a separate estimate for those aged 3, 4 and 5 years.

[79] Who are not at infants/primary school.

This specification will show how certain factors are associated with attendance across the total population, as well as whether Indigenous children have higher or lower probabilities of attending after controlling for these factors.

After showing that Indigenous children have a lower probability of attendance when aged 4 and 5 years in the first specification, the second includes separate estimations by Indigenous status but estimated for those aged 4 and 5 years only. This specification will show whether there are different associations for the Indigenous population compared to the non-Indigenous population.

Once again, the probit model is assumed and the parameters estimated via maximum likelihood. Results are presented as marginal effects which represent the predicted change in the probability of attending preschool compared to the base case. Those variables that were not significant at the 10% level of significance are marked as n.s. with those only significant at the 10% but not the 5% level marked with an ** and those significant at the 5% but not 1% significance level marked with an *. The third-last line of the table gives the estimated probability of the 'base case' child attending preschool. The next line gives the Pseudo R-Squared and the final line of the table gives the sample size used for the estimations.

8.2 Factors associated with preschool attendance – Results

8.2.1 Results by age

The following table presents the estimated marginal effects on the probability of attending preschool.

Table 8.2 Marginal effect on the probability of attending preschool – by age

Explanatory variables	Age 3	Age 4	Age 5
Female	0.012	0.011	n.s.
Indigenous	0.041	-0.052	-0.109
Born overseas	0.017	-0.025	-0.045
At least one parent born overseas	-0.018	-0.037	n.s.
Degree in family	0.039	0.061	0.039
No Year 12 in family	-0.014	-0.032	-0.024
Other children in family	n.s.	n.s.	0.008
Household income in 1st quintile	-0.026	-0.066	-0.055
Household income in 2nd quintile	-0.016	-0.029	-0.023
Household income in 4th quintile	0.010	0.025	0.015
Household income in 5th quintile	0.053	0.056	0.028
Victoria	-0.119	-0.033	0.047
Queensland	-0.212	-0.189	0.153
South Australia	-0.134	0.159	0.064
Western Australia	-0.222	0.104	0.176
Tasmania	-0.160	-0.222	0.119
Northern Territory	-0.173	0.135	0.029
Australian Capital Territory	-0.172	n.s.	0.109
Inner-regional area	-0.029	0.006**	0.030
Outer-regional area	-0.039	0.008*	0.034
Remote area	-0.050	n.s.	n.s.
Very remote area	n.s.	-0.136	-0.103
Predicted probability of "base case"	0.385	0.639	0.711
Pseudo R-Squared	0.097	0.047	0.069
Number of observations	200,437	195,262	90,841

Source: Customised calculations from the 2001 Census. Coefficient estimates and p-values are given in Table 8A.1

Base case: a male; non-Indigenous; born in Australia; with both parents born in Australia; living in a family where at least one person has completed Year 12 but no-one has a degree; no other children aged 0 to 5 in the family; equivalised household income in the third quintile; lives in New South Wales; and lives in a major city.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

Looking first at the marginal effect for being identified as Indigenous, in comparison to the bi-variate probabilities presented in Chapter 2, after controlling for the other variables in the model, Indigenous 3-year-olds are more likely to be attending preschool than a similar non-Indigenous Australian. For an Indigenous 4 and 5-year-old, on the other hand, the probability is significantly lower. In other words, for 3-year-olds, the lower observed probability presented in Chapter 2 is caused by the distribution of other factors that are also likely to be related to preschool attendance. With 4 and 5-year-olds, however, it is not only the distribution of other factors that lead to a lower probability. Instead there is likely to be unobserved factors whether it be to do with choice, culture, language or access that means an otherwise comparable Indigenous 4 or 5-year-old is less likely to attend preschool.

So how are these other factors associated with the probability of attending preschool? Firstly, being female has a small but significant positive association with attending preschool for 3 and 4-year-olds, but no association for 5-year-olds. Of the family level variables, presence or absence of certain types of education has the strongest and most consistent association. Compared to other families, those which contain at least one person who has completed a degree are more likely to send their children to preschool. Compared to this, those families with both no degree and no-one who has completed Year 12 are less likely to attend. Given the model controls for access to resources, this result possibly stems from the fact that those with higher education levels are more likely to have had positive experiences at school and/or have positive views towards formal education in general.

Access to resources (as measured in the model) also has a constant and significant association with preschool attendance. Higher-income households (after equivalising to take into account household size) are more likely to send their children to preschool than lower-income households. The association with income is, for the most part, linear.

Remoteness also has a significant albeit varied effect. Interestingly though, apart from the very remote Australia variable, the magnitudes of the marginal effects are not large. Given quite different policies regarding preschool education across the different states and territories, one would expect there to be variation in the probability of attending preschool across these variables. As it turns out, not only are the differences within each age quite large, the nature of the differences also vary by age. For 3-year-olds, all the marginal effects are negative showing that of the eight states and territories, children in New South Wales have the highest probability of attendance. Of the remaining states, Queensland and Western Australia have the lowest probability of attending (both having probabilities close to zero) whereas South Australia and Victoria have the highest probabilities outside New South Wales.

For 4-year-olds, those in New South Wales no longer have the highest probability of attending with those in South Australia, Western Australia and the Northern Territory all having a higher probability of attending preschool. Victoria, Queensland and Tasmania have the lowest probability with there being no significant difference between the Australian Capital Territory and New South Wales which are both in the middle. Finally for 5-year-olds, New South Wales now has the lowest probability of attending. Victoria, South Australia and the Northern Territory have a slightly higher probability with Queensland, Western Australia, Tasmania and the Australian Capital Territory all having a probability 0.100 higher than New South Wales (i.e. a probability of virtually one). Like in the USA (Cappizzano, Adams and Sonenstein 2000) State government policy seems to have a substantial effect on preschool attendance.

8.2.2 Factors associated with preschool attendance by Indigenous status

That Indigenous Australians generally have a lower probability of attendance controlling for all other factors for 4 to 5-year-olds, but not 3-year-olds was shown by Table 8.2. The following table presents results looking at how the association between attendance and other explanatory variables is different for Indigenous and non-Indigenous 4 to 5-year-olds. For these models, two binary variables have been added. The first measures whether any of the people who identify as working in the preschool industry and working in the area the child lives are Indigenous. The second variable is for whether there are any preschool workers in the area, Indigenous or otherwise.

Table 8.3 Marginal effect on the probability of attending preschool – by Indigenous status (children aged 4 to 5 years)

Explanatory variables	Indigenous	Non-Indigenous
Aged 5 years	0.202	0.229
Female	n.s.	0.008
Born overseas	n.s.	-0.035
At least one parent born overseas	0.053	-0.026
Degree in family	0.073	0.056
No Year 12 in family	-0.055	-0.028
Other children in family	n.s.	n.s.
Household income in 1st quintile	-0.103	-0.061
Household income in 2nd quintile	-0.050	-0.027
Household income in 4th quintile	n.s.	0.022
Household income in 5th quintile	n.s.	0.049
Victoria	n.s.	-0.008
Queensland	n.s.	-0.054
South Australia	0.154	0.151
Western Australia	0.115	0.153
Tasmania	n.s.	-0.106
Northern Territory	n.s.	0.191
Australian Capital Territory	n.s.	0.047
Inner regional area	n.s.	0.013
Outer regional area	n.s.	0.013
Remote area	-0.043*	n.s.
Very remote area	-0.166	-0.067
Indigenous preschool worker in area	0.049	0.007
Any preschool worker in area	n.s.	n.s.
Predicted probability of "base case"	0.548	0.596
Pseudo R-Squared	0.061	0.067
Number of observations	11 829	274 274

Source: Customised calculations from the 2001 Census. Coefficient estimates and p-values are given in Table 8A.2

Base case: aged 4 years; a male; born in Australia; with both parents born in Australia; living in a family where at least one person has completed Year 12 but no-one has a degree; no other children aged 0 to 5 in the family; equivalised household income in the third quintile; lives in New South Wales; lives in a major city; and lives in an area without any Indigenous preschool worker.

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.

Apart from there being a larger number of insignificant variables for the Indigenous population, the majority of variables that are significant have the same sign as for the non-Indigenous population. Interestingly though, the magnitudes of the marginal effects are generally much higher for the Indigenous population. This is especially the case for those who live in very remote Australia. Here the probability was 0.067 points lower than the non-Indigenous base case, but was estimated to be 0.166 points lower for the Indigenous population. Furthermore, the coefficient for those living in remote Australia is significant (and negative) for the Indigenous population, but insignificant for non-

Indigenous 4 and 5-year-olds. In other words, the effect of remoteness is much greater for the Indigenous population. The estimated marginal effect of living in a household with low income is also greater for the Indigenous population,[80] as is the marginal effect of the education levels in the family.

The table shows that having an Indigenous preschool worker working in the child's area has a positive and reasonably large association with attendance for the Indigenous population, but a virtually zero (albeit still significant) association for the non-Indigenous population. Indeed, an Indigenous 4 or 5-year-old who lives in such an area (whilst setting the other characteristics equal to the base case) is predicted to have a probability of attendance almost exactly the same as a non-Indigenous Australian with the same characteristics.

8.3 Factors associated with attendance at non-government schools – Background and method

While school preparedness and attendance at a good quality preschool is important for the development of a person's cognitive and non-cognitive ability, so too are the amount of resources devoted to a person's education throughout the rest of their school life. Those students who attend schools that are well resourced are likely to have greater access to their teacher, an improved range of educational resources and possibly greater attention to their individual curriculum needs. For students from a low socio-economic background, the resources channelled through their schools are crucial in at least partly addressing the relative lack of resources they receive towards their own education and development outside of school.

Unlike in the USA, in a national and state-funded system like Australia there is likely to be less variation in the level of resources a school has available to them by socio-economic status in the local area (Overman and Heath 2000). However, because of the

[80] That the high-income variables are not significant reflects the fact that there are only a relatively small proportion of Indigenous children who live in such households.

geographical size of Australia and the sparseness of the population, rural and remote schools may suffer from a relative lack of resources. This could be because of the cost of resources in these areas meaning that a dollar spent per student results in less actual resources. In addition, because rural and remote schools are much more likely to have new or recent graduates as their teachers (Sharplin 2002) the level of funding per teacher is likely to be lower. Because Indigenous youth are more likely to live in rural and remote areas, the effective amount of resources devoted to their education might be lower than for non-Indigenous students.

Federal and State governments recognise this potential deficit in resources and provide additional funding to schools with Indigenous students in them (DEST 2006). However, an additional factor that is likely to influence the relative amount of resources devoted to Indigenous and non-Indigenous students is the school sector that they attend. For example, Ryan and Watson (2004) showed that although there had been some fluctuation over the 30 years up until 2002, the student-to-teacher ratios in Independent secondary schools was lower than those in government schools. Although a little more difficult to measure, things like computing, sporting and artistic resources may also vary by school sector.

The remainder of this section outlines in brief the structure and effect of non-government school attendance in Australia (Section 8.3.1) and the rate of Indigenous attendance in these schools (Section 8.3.2).

8.3.1 The non-government school sector in Australia

The school system in Australia can be categorised into three broad sectors. The first, the government sector, is provided by State governments, does not charge school fees and has an obligation to provide a place for every eligible student regardless of background or financial position.[81] In 2005, 70.9% of primary students and 61.8% of secondary students

[81] Within government schools, there are selective schools that choose students based on certain measures of academic performance or potential. They still do not, however, charge compulsory school fees.

were attending government schools. Non-government schools, on the other hand, do charge school fees, although these school fees make up varying proportions of their total revenue. These schools have a range of affiliations; however, the largest is the Catholic school system which accounts for 19.1% of primary and 21.5% of secondary school students. Other non-government (or Independent) schools made up the remaining 10.0% of primary and 16.7% of secondary school students (ABS 2006a).

The proportion of students attending non-government schools has increased quite substantially in the last 30 to 40 years. This has been caused in part by Commonwealth Government funding to non-government schools that began in the early 1950s and has increased reasonably steadily (even on a per capita basis) since. Ryan and Watson (2004) show that the increase in funding has not led to a fall in school fees charged by non-government schools but rather an increase in the amount of resources devoted to each student. This in turn has lead to maintenance of relatively high socio-economic status students attending non-government schools.

Because of this relatively high socio-economic background of non-government school students, it is difficult to identify whether a comparable student in these sectors has on average better outcomes than those in the government sector. That is, although those in the non-government sector are more likely to complete high school and do so with higher grades, it is unclear whether they do so because of school factors or because the students that enter these school systems would achieve better outcomes anyhow (Le and Miller 2003). That is, there are likely to be selection effects contaminating any cross-tabulation or simple regression.

In the absence of experimental or quasi-experimental data where students are randomly assigned to government and non-government schools, it is impossible to completely discount the selection effects. Nonetheless, Vella (1999) and Le and Miller (2003) do find that after trying to control for selection, students who attend non-government schools have better outcomes than those that attend government schools.

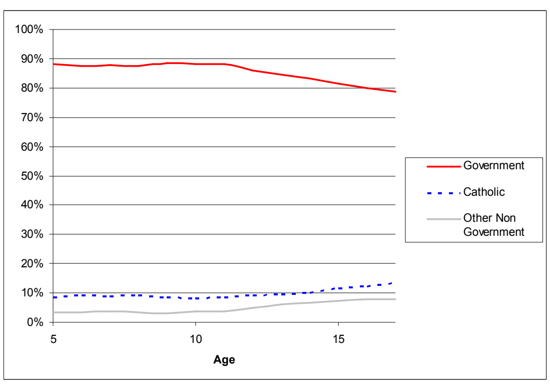
8.3.2 Indigenous attendance at non-government schools

Having presented research that shows that the amount of resources devoted to students in non-government schools is higher than in government schools and that students in non-government schools perform better, the issue for this thesis is whether Indigenous students are being disadvantaged in their access to these schools. In other words, relatively low attendance at non-government schools for Indigenous Australians may be a signal of less resources devoted to their education and may be a cause of lower cognitive and non-cognitive ability by the time a student reaches late secondary school.

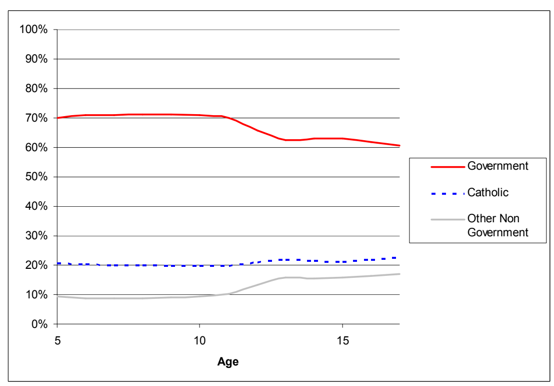
The following figure shows that, according to the 2001 Census, Indigenous students were less likely to be attending non-government schools than the non-Indigenous population. Figure 8.1 gives separate graphs for the Indigenous and non-Indigenous populations and plots the percentage attending each of the three school sectors by age.

Figure 8.1 School sector by age and Indigenous status – Those aged 5 to 17 years attending school in 2001

8.1a Indigenous



8.1b Non-Indigenous



Source: Customised calculations from the 2001 Census

In addition to showing lower rates of attendance for the Indigenous population, Figure 8.1 also shows slightly different patterns by age. Both Indigenous and non-Indigenous Australians have steady rates of attendance at government schools until about the age of 12. For the Indigenous population, beyond that age (when secondary school generally starts) the percentage drops reasonably steadily, made up of corresponding increases in the percentage attending both Catholic and other non-government schools. For the non-Indigenous population, the decrease is initially more pronounced, then the percentages level off beyond 13 years of age. In addition, the rates of attendance in Catholic schools are reasonably steady, with most of those leaving government schools opting for other non-government schools.

There are likely to be a number of other factors apart from age and year level influencing the proportion of the respective populations attending non-government as opposed to government schools. Ryan and Watson (2004) as well as Preston (2003) found differences in patterns of attendance by socio-economic status. This is not surprising, as those from low-income backgrounds are less likely to be able to afford the school fees that non-government schools charge. However, there are other factors that are likely to influence the choice of school, including household composition and where in Australia a person is living. Some of these factors are likely to affect the preference for non-government schools, other factors access to the schools.

The relative distribution of these factors may explain the lower attendance rate of Indigenous Australians. Furthermore, these factors may have a different association for the Indigenous population. Identifying the factors associated with school sector will therefore give some insight into why the Indigenous Australians are less likely to be attending non-government schools and hence why there may be a disparity in the resources devoted to their education throughout their schooling.

8.3.3 Factors associated with attendance at non-government schools – Model specification

To look at the factors associated with attendance of non-government schools, a modelling approach is once again taken. The dependent variable is whether or not a school student (infants/primary or secondary) is attending a non-government as opposed to a government school. All those aged 5 to 17 are included in the sample and a separate model is estimated for Indigenous and non-Indigenous males and females.

The independent variables capture a person's demographic characteristics, the state and remoteness of the area of their usual residence, and the socio-economic characteristics of their households. The individual and household variables from Chapter 7 are used for this section. However, to capture a greater range of factors that influence the decision of what type of school to attend and the fact that the models are being estimated across a greater age range, two additional sets of variables are included. The first is whether or not a person is attending infants or primary as opposed to secondary school. This variable is included to reflect the drop in government school attendance around the age of 12 years old presented in Figure 8.1. A linear age term is also used to capture any other changes in attendance as students get older.

While the decision to send a child to a non-government school is likely to be made in part for education-related reasons, many parents or guardians may do so because of the religious aspects of the schools. The second set of additional variables is therefore a person's self-reported religion with the base case being a non-Catholic Christian. Three other variables are constructed representing whether a person is either Catholic, has a non-Christian religion and finally has no religion. For the estimates on the Indigenous population, an additional variable is included for whether an Australian Aboriginal Traditional Religion is reported.

The only difference between the household variables used in this section and those used in Chapter 7 is that instead of having an indicator variable for whether there are any children younger than 15 in the household, a linear count of the number of children under 15 is used. This is done to explicitly take into account the resource constraints of sending more than one child to a non-government school. Summary statistics for the variables used in this section are given below.

Like in Chapter 7 where students' cognitive and non-cognitive ability are important aspects of the education decision that were not able to be included in the model, when looking at non-government school attendance there are also a large number of unobservable variables that are likely to impact on the decision. At the individual and household level, this includes the value that is placed on education and/or the other perceived benefits and non-monetary costs of non-government schools. At the area level, the availability of quality government schools or quality and affordable non-government schools is likely to have an effect. Where the variables included in the model are potentially proxying for these unobservables, this is mentioned in the discussion of the results. However, the association with these unobservables will ultimately need to be established with alternative data sources

Table 8.4 Individual, household and geographic variables associated with non-government school attendance

Explanatory variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Average age	10.23	10.34	10.84	10.89
Attending infants or primary school	0.295	0.319	0.389	0.402
Attending secondary school	0.705	0.681	0.611	0.598
Non-Catholic Christian	0.491	0.497	0.412	0.418
Catholic	0.280	0.280	0.339	0.342
Other non-Christian religion	0.005	0.005	0.045	0.045
Australian Aboriginal Traditional Religion	0.011	0.011	n.a.	n.a.
No religion	0.213	0.207	0.204	0.195
Does not speak a language other than English	0.890	0.888	0.895	0.894
Speaks another language and English well	0.077	0.084	0.102	0.103
Speaks another language and English not well	0.033	0.028	0.003	0.003
Identifies as Aboriginal only	0.900	0.899	n.a.	n.a.
Identifies as Torres Strait Islander or both Aboriginal and Torres Strait Islander	0.100	0.101	n.a.	n.a.
Born in Australia	0.967	0.968	0.926	0.926
Born overseas	0.033	0.032	0.074	0.074
Both parents born in Australia	0.931	0.930	0.659	0.661
Parents born overseas	0.069	0.070	0.341	0.339
Did not move between 1996 and 2001	0.678	0.680	0.742	0.738
Moved between 1996 and 2001	0.322	0.320	0.258	0.262
New South Wales	0.330	0.330	0.341	0.342
Victoria	0.057	0.061	0.247	0.248
Queensland	0.276	0.276	0.186	0.186
South Australia	0.052	0.054	0.080	0.079
Western Australia	0.133	0.130	0.095	0.094
Tasmania	0.046	0.045	0.025	0.025
Northern Territory	0.097	0.095	0.007	0.007
Australian Capital Territory	0.009	0.010	0.019	0.019
Major city	0.253	0.256	0.540	0.541
Inner regional	0.264	0.267	0.307	0.307
Outer regional	0.243	0.236	0.126	0.126
Remote	0.068	0.064	0.017	0.017
Very remote	0.172	0.177	0.009	0.009
Single-person household	0.001	0.001	0.000	0.000
Highest education in the household a degree	0.064	0.060	0.244	0.243
Highest education other qualification without Year 12	0.161	0.159	0.173	0.173
Highest education other qualification with Year 12	0.094	0.094	0.194	0.194
Highest education Year 12 but no qualification	0.142	0.142	0.152	0.152
No-one in household completed Year 12 or has qualification	0.539	0.544	0.236	0.237
No adult in the household with different Indigenous status	0.434	0.433	0.996	0.996
At least one adult with different Indigenous status	0.566	0.567	0.004	0.004
Number of people in the household	6.033	5.512	4.587	4.573
Number of children under 15 in the household	3.051	2.871	2.113	2.081
Number of people per bedroom in the household	1.679	1.683	1.285	1.280
No-one in the household owns or is purchasing the home	0.691	0.698	0.235	0.237
Household owns or purchasing home	0.309	0.302	0.765	0.763
Equivalised income of others in the household	335.6	334.1	540.3	541.6

Source: Customised data from the 2001 Census

8.4 Factors associated with attendance at non-government schools – Results

Results are once again presented as marginal effects or the predicted change in probability compared to the base case. The marginal effect for age refers to the change in predicted probability between a 15-year-old (the base case) and a 16-year-old. Those variables that were not significant at the 10% level of significance are marked as n.s. with those only significant at the 10% but not the 5% level marked with an ** and those significant at the 5% but not 1% level of significance marked with an *. The second-last line of the table gives the Pseudo R-squared and the final line of the tables gives the sample size upon which the estimates are based.

Table 8.5 Marginal effects on the probability of attending a non-government school – By Indigenous status for those attending high school

	Indigenous		Non-Indigenous	
Explanatory variables	Male	Female	Male	Female
Age	n.s.	n.s.	0.000*	n.s.
Infants or primary school student	n.s.	-0.014	-0.059	-0.065
Catholic	0.145	0.170	0.317	0.323
Other non-Christian religion	0.042	0.045*	-0.020	-0.022
Australian Aboriginal Traditional Religion	0.004	n.s.	n.a.	n.a.
No religion	-0.018	-0.027	-0.094	-0.099
Speaks another language and English well	0.030	0.025	0.049	0.046
Speaks another language and English not well	0.032	0.020*	0.035	0.051
Torres Strait Islander+	n.s.	n.s.	n.a.	n.a.
Born overseas	n.s.	n.s.	-0.026	-0.024
Parents born overseas	n.s.	n.s.	0.013	0.016
Moved between 1996 and 2001	-0.006	-0.011	-0.005	-0.003
Victoria	0.009**	n.s.	0.023	0.030
Queensland	0.010	0.008*	0.020	0.023
South Australia	0.043	0.038	0.065	0.072
Western Australia	0.030	0.029	0.022	0.030
Tasmania	0.037	0.032	0.070	0.078
Northern Territory	0.015	0.036	0.079	0.075
Australian Capital Territory	0.046	0.073	n.s.	n.s.
Inner regional	-0.005*	-0.008	-0.035	-0.035
Outer regional	-0.006*	-0.007*	-0.060	-0.063
Remote	-0.013	-0.015	-0.094	-0.095
Very remote	0.007**	n.s.	-0.104	-0.118
Single-person household	0.099**	n.s.	0.135	0.088
Highest education in the household a degree	0.076	0.076	0.169	0.173
Highest education other qualification without Year 12	0.018	0.021	0.044	0.044
Highest education other qualification with Year 12	0.034	0.048	0.105	0.106
Highest education Year 12 but no qualification	0.020	0.029	0.087	0.086
At least one adult with different Indigenous status	n.s.	n.s.	-0.047	-0.040
Extra person in the household	-0.002	-0.003	n.s.	-0.002
Child under 15 in the household	n.s.	0.002**	0.019	0.018
Extra person per bedroom	0.003*	n.s.	-0.045	-0.046
Household owns or purchasing home	0.044	0.046	0.065	0.065
Equivalised income of others in the household	0.012	0.014	0.042	0.043
Probability of the base case	0.047	0.059	0.176	0.183
Pseudo R-squared	0.1365	0.1373	0.1789	0.1789
Number of observations	34,840	33,441	1,031,868	1,003,164

Source: Customised data from the 2001 Census. Coefficient estimates and p-values are given in Table 8A.3 to 8A.4

Base case: Aged 15; Attending secondary school; Christian but not Catholic; speaks English only; born in Australia; both parents born in Australia; does not identify as a Torres Strait Islander; did not change usual residence between 1996 and 2001; lives in New South Wales; lives in a major city; no-one in the household has completed Year 12 or has a qualifications; no adults in the household of a different Indigenous status; no children under 15 in the household; lives in a four-person household with one person per bedroom; does not live in a household where someone owns or is renting the home; and the household has a equivalised income of $508

Note: Significance levels are marked as follows: n.s. refers to those not significant at the 10% level, ** those significant at the 10% but not at the 5% level and * those significant at the 5% but not the 1% level. All else are significant at the 1% level.+ Includes those who identify as both Aboriginal and Torres Strait Islander.

The first two lines of marginal effects in Table 8.5 confirm the findings from Figure 8.1 in that those who are attending infants or primary school are less likely to be attending a non-government school compared to those attending secondary school. The variable was not, however, significant for Indigenous males and the marginal effect was reasonably small for Indigenous females. Increases in the probability of attending a non-government school as a child reaches secondary school age is likely to be caused in part by parents and guardians wanting to take advantage of the educational aspects of these schools. After controlling for whether the person is in infants or primary school, there was no significant association with the linear age term for three of the estimations and had a very small marginal effect for the fourth.[82]

Individuals whose reported religion is Catholic are much more likely to be attending non-government schools than other Christians. This reflects the large Catholic school system in Australia and shows that a large part of the decision to send students to non-government schools is made because of apparently non educational reasons. For the Indigenous population, those who report a Traditional Aboriginal Religion do not in general have a significantly probability of attending a non-government school compared to non-Catholic Christians.

Those who speak a language other than English at home are significantly more likely to be attending non-government schools. This is true whether the individual speaks English well or not well and was found for both the Indigenous and the non-Indigenous estimations. This may be explained by there being more specialist language schools that cater to non-English speakers in the non-government sector.

All states and territories (apart from Victoria for the Indigenous estimates) had a higher probability of attending non-government schools than New South Wales. Although the probability of attending a non-government school in remote Australia is lower than those in major cities, for Indigenous females there is no significant difference for those in very remote Australia. For Indigenous males the magnitude of the marginal effect is quite

[82] A more flexible age specification was also, for the most part, insignificant.

small. Remembering that the remoteness variables are for a person's usual residence not where they happen to be on Census night, the results show that for the Indigenous population there are few other education options in very remote Australia. Hence, those who choose to attend school may have to do so through the non-government sector. This is likely to be in part through attending boarding school or other options like home schooling.

Education levels in the household have a reasonably consistent and positive association with the probability of attending high school, as does equivalised household income. While the education variables may reflect a preference for non-government education, the association with income levels (and home ownership) probably reflects a lack of access for those students from low socio-economic backgrounds.

Even after controlling for these individual, household and area-level variables, the probability of attending non-government schools of the base case Indigenous child or youth is much lower than for a corresponding non-Indigenous Australian. This shows that segments of the population are less willing or less able to make the choice to send their children to non-government schools. If non-government schools confer some form of education benefit to those who attend, then without reducing these disparities in attendance non-Indigenous children and youth are likely to continue to have higher levels of skills development and therefore higher rates of school completion. The policy responses to such a finding will be influenced strongly by the relative value one places on parental choice and are considered in the following section.

8.5 Summary

Previous chapters have shown that despite relatively high predicted economic and health benefits of education and after controlling for a range of individual, household and area-level factors, Indigenous youth are still less likely to be attending high school than the non-Indigenous population. This lower attendance may be because of lower levels of cognitive and non-cognitive ability as valued in formal education than the non-

Indigenous population. One policy response to this is to better accept and integrate into the school system the abilities that Indigenous students have. However, there are likely to be only a small number of well remunerated jobs that make use of such skills, so an enhancement of the English language, numeracy and other academic abilities of Indigenous Australians must be done alongside this.

There are a range of factors that are likely to impede the skills development of the Indigenous population. Firstly, preferences may be having an effect. That is, the skills that are rewarded through the education system and the contemporary labour market are only one set from a larger range of abilities. As the Indigenous population makes up only a small percentage of the total population, the abilities that they value are less likely to be amongst those that are rewarded. While there is the capacity to take advantage of niche markets like arts, crafts and music, this is unlikely to be possible or desirable for all Indigenous Australians. A further impediment to the development of ability is likely to be inter-generational. That is, because the adult Indigenous population has themselves been constrained in their educational attainment, they may be less able to help their children in being ready for Western schools and in other ways throughout their school career.

Two further factors that were looked at in this chapter are preschool attendance and attendance at non-government schools. The first of these is likely to influence how ready a child is to start school whereas the second might influence the amount of resources devoted to a child's education. The factors associated with these two types of educational attendance and the implications are summarised below.

8.5.1 Preschool attendance and Indigenous Australians

After controlling for only a limited set of factors associated with preschool attendance, an Indigenous 3-year-old is more likely to attend preschool than a non-Indigenous child of the same age. Although Indigenous 4 and 5-year-olds are less likely to attend after controlling for the same factors, the marginal effect of being Indigenous is less than the raw probabilities would suggest.

The low attendance of Indigenous children is therefore as much to do with the relative distribution of other characteristics, the different effect these characteristics have and other characteristics unique to Indigenous Australians. The households in which Indigenous children live are likely to have lower incomes than the households non-Indigenous children live in. The education levels in the family are also lower for Indigenous children. The most consistent finding on the factors associated with preschool attendance has been that both are associated with lower attendance in preschool. What this chapter has also shown is that the effect on Indigenous children of these factors is even greater than for the non-Indigenous population.

The disparities in household income and education are unlikely to be eliminated in the short term. However, policies concerning access and subsidy of preschool education may be an important way of reducing the disparities in attendance by income.

Most likely because of transport and other costs, children who live in remote and very remote areas are less likely to attend preschool. Indigenous children are doubly disadvantaged because they are much more likely to live in these areas and the effect of remoteness appears to be greater for them.

This chapter has not attempted to answer the question of whether the costs involved with increasing preschool attendance for Indigenous Australians is worth it. The data to support such an analysis are not available in Australia; however, cost-benefit analyses from the USA suggest that it is likely to be the case and increasing the attendance rates of Indigenous children is one of the stated aims of the Commonwealth Government (DEST 2005).

Given this, it has been shown in this thesis that the presence of a preschool worker who themselves identifies as Indigenous and is working in the area in which a child lives significantly increases attendance. Importantly, there were no adverse effects of Indigenous preschool workers on attendance of non-Indigenous children.

However, less than 30% of Indigenous Australians live in areas with Indigenous preschool workers. There are of course difficulties in recruiting Indigenous preschool workers; however, this thesis has shown the potential benefit of doing so. In particular, the association both Indigenous preschool workers and education levels in the family have on preschool attendance, supports the call by Schwab and Sutherland (2003) for the introduction of a greater number of Indigenous learning communities. Such communities, where schools become the focal point for the community and support a greater role for Indigenous parents in their and their children's education, are likely to make Indigenous parents more comfortable in sending their kids to what they see as culturally inclusive preschools.

8.5.2 Non-government school attendance and Indigenous Australians

In addition to preschool attendance, Indigenous Australians may have had lower levels of skills development when they reach late secondary school because of the level of resources devoted to them throughout their earlier school career. This, in turn, may be influenced by the type of school that a child attends, including whether they attend a government or non-government school. Vella (1999) and Le and Miller (2003) showed that even after controlling for the type of student who attends, non-government school students had a higher rate of school completion than those in government schools.

This chapter looked at non-government school attendance and found that the probability of the base case Indigenous child or youth was substantially lower than an otherwise identical non-Indigenous child or youth. If this is through lack of access to these schools rather than a preference, then this is one way in which non-Indigenous youth may be advantaged relative to the Indigenous population. In looking at the factors associated with attendance, there were a number that were significant that most likely represented a preference for these types of schools. Chief amongst these was a person's identified religion with those who identified as being Catholic having a significant and quite large positive difference in attendance compared to other Christians, as well as other religious groups. Education levels in the household may also represent a preference for these types of schools;[83] however, alongside household income and other measures of socio-economic status, it also shows that access is generally limited to those who are relatively well off.

There are a number of potential externalities from a child or youth moving from the government to non-government school sector that make the policy response to low Indigenous attendance somewhat problematic. Firstly, as mentioned previously, a number of reasons for why parents or guardians send their children to non-government schools are through preference as represented by the large marginal effect on some of the religion variables. Presumably parents and guardians may also be more inclined to send their children to government schools out of a preference for that system. Any moves to increase non-government school enrolment of Indigenous students should carefully take into account these preferences.

Perhaps a more important reason for being wary about increasing non-government school enrolment is the potential negative effects on those students who remain in the government school system. Ryan and Watson (2004) found that increases in non-government school enrolment over the last 30 years were made up primarily of those from relatively high socio-economic backgrounds. The results presented in this thesis also confirmed that those in non-government schools had higher average incomes than those in government schools and higher levels of education in their households. Therefore, if any increases in non-government school students come from those in the upper tail of the current cohort of government school student in terms of academic potential, then this will lead to fewer positive role models for those who remain in the government school sector.

One policy intervention that has the potential to improve the outcomes of a number of Indigenous youth is the Higher Expectations Program (HEP) being trialled by the CYI.

[83] Unfortunately it was not possible to test whether others in the household completed their schooling at a government or non-government school.

However, it is a good example of a program that has the potential to have adverse effects on others not involved in the program. The aim of the HEP is to identify 'academically talented youth from Cape York and sponsor them to attend one of six 'partner' boarding schools in Queensland' (CYI 2006). Given the resources devoted to the support and tuition of those students who are selected for the program, it is likely that they will have a much higher chance of completing school, opening up the possibility of future study and higher incomes. However, by targeting those who are academically talented, positive role models for those who remain in the area are likely to be lost. These negative effects may be counter-balanced into the future if these individuals return to the communities and act as positive role models; however, this is not guaranteed. These negative side effects do not negate the benefit of such programs. Rather, the point is that careful consideration must be given to the other students who may be negatively impacted.

Given the above issues, a more effective policy response might be to make sure that the schools that the average Indigenous student is attending are equally well resourced as those of the average non-Indigenous student, regardless of what sector they are in. This leads to the wider debate of a universal public school system and Commonwealth Government support of private education. While such a debate is beyond the scope of this thesis, the main conclusion remains that whilst Indigenous students attend well resourced non-government schools at a lower rate than the non-Indigenous population their academic development will continue to lag behind.

Chapter 9 Improving education and labour market outcomes for Indigenous Australians: Conclusions and contribution to the literature

Since the 1967 referendum that gave the Commonwealth power to make laws that specifically benefited Indigenous Australians, there have been dramatic changes in the Australian economy and wider Australian society (Altman, Biddle and Hunter 2005). Since then, although the employment-to-population ratio for the non-Indigenous population has remained reasonably steady (57.8% in 1971 and 58.9% in 2001) this represents the absorption into the labour force of the almost 50% increase in the population during this time. Furthermore, while income was not collected in the 1971 Census, between 1981 and 2001, median individual income for the non-Indigenous population increased from $341.0 to $379.7 (after controlling for inflation).[84]

During those 20 or 30 years, it can be argued that despite the increased power of the Commonwealth the Indigenous population has not benefited as much as they might have from expansion in the economy and government revenue. According to Altman, Biddle and Hunter (2005) median individual income for the Indigenous population is still only a little over half that of the non-Indigenous population and the relative employment to population ratios have actually gotten worse.

Carneiro, Heckman and Masterov (2003) suggest two very different policy responses to a situation where one subgroup of the population has poorer economic outcomes than the majority. On the one hand, if two people of identical skill but of different ethnicity are treated differently in the labour market, then there is a strong argument for focussing on affirmative action and anti-discrimination laws. If, on the other hand, the gaps in economic outcomes are caused by the lower levels of skills, abilities and qualifications that people bring to the labour market, then the focus of policy should be on removing the

[84] Between August 2001 and August 2006 average weekly earnings increased by a further 7.6% in real terms (ABS 2007)

factors that are inhibiting skills acquisition. These skills may be measured, for example through formal qualifications, or unmeasured cognitive and non-cognitive ability.

Indigenous Australians are clearly one population that has poorer outcomes than the rest of Australia across a range of socio-economic indicators. In this thesis, previous research and new statistics were summarised and presented that also showed lower levels of education attainment and participation. Insight into the distinction made by Carneiro, Heckman and Masterov (2003) as it applies to the Indigenous population will be useful in designing any policy responses that aim to reduce this disparity in outcomes.

While the potential direct effects that increased levels of education might have on employment probabilities and average income are reason enough to look at ways to improve participation, there are also broader effects that provide further motivation. A useful way to conceptualise these broader effects of education is through the concept of capabilities (Sen 1999; Saito 2003). The ability to obtain employment and an adequate income is one aspect of a person's capabilities. However, the concept of capabilities (or the related concepts of freedom, agency or autonomy) also refers to a person's ability to not only direct their lives in the way they would like, but also identify what direction is best for them and choose the actions that are required to get them there.

To help understand reasons why people of identical skills or ability might be treated differently in the labour market or alternatively why there may be barriers to the development of skills and ability for the Indigenous population, a model was developed that linked a person's education participation to the potential benefits of doing so net of the cost. However, a number of reasons were outlined for why the standard model might not be applicable to Indigenous Australians. A number of extensions to the model were therefore added that took into account the distribution of ability, unobserved costs of education and uncertainty regarding what the benefits of education might be.

This model raised two main research questions that were examined in this thesis. The first is what are the benefits of education for the Indigenous population? These predicted benefits of education were first calculated at the national level. However, one reason for why there might be variation in the predicted benefits of education that was proposed using the HCM is because of geography. Hence, a supplementary research question was how do the predicted benefits of education vary by geography? The main outcomes that were focussed on are employment and income; however, there was also analysis of the extent to which those with higher education levels report better health outcomes or more favourable health behaviour.

The second main research question is what factors are associated with the decision to attend high school? That is, does the Indigenous population respond to the economic incentives as estimated in this thesis? In addition, other factors at the individual, household and area-level are likely to influence the social costs and benefits of education, as well as geographical and financial access. The extent to which these are associated with high school participation was also examined. The HCM focussed somewhat on how a person's cognitive and non-cognitive ability influences their educational choices and outcomes from education. To gain some insight into reasons why ability levels might be different for the Indigenous compared to the non-Indigenous population, two further research questions were considered. That is, what are the factors associated with preschool attendance and what are the factors associated with attendance in non-government schools?

This final chapter of the thesis summarises the empirical evidence used to answer these research questions and outlines how the results contribute to the evidence base from which education and labour market policy for Indigenous Australians can be designed. In Section 9.1 the evidence from Chapters 5 and 6 which looked at the predicted benefits of education for Indigenous Australians is summarised. Section 9.2 summarises Chapters 7 and 8 which looked at the factors associated with education participation.

This chapter also outlines the policy conclusions and recommendations that arise from these empirical results. There are two types of recommendations given. The first (given in Section 9.3) is for those who design or implement public policy related to Indigenous

Australians. In recognising that there are still a number of gaps in the evidence base from which such policy conclusions should flow, however, the second set of recommendations (in Section 9.4) is for those who collect data on Indigenous Australians or undertake empirical research using these data.

9.1 Predicted benefits of education for Indigenous Australians

The first set of results presented used the 2001 Census to look at the difference between an Indigenous and non-Indigenous Australian's employment and income outcomes depending on their education completion. Two levels of analysis were undertaken. The first compared those who completed Year 12 with those who didn't. The second took into account post-school qualifications including degrees and undertook a five-category education comparison.

The difference in lifetime employment by education was generally higher for the Indigenous population compared to the non-Indigenous population, and females compared to males. The biggest difference in employment was between those Indigenous Australians who did not complete Year 12 but obtained post-school qualifications compared to those who did not complete Year 12 but did not obtain qualifications. The difference in lifetime full-time employment by education was even greater than the difference in employment, especially for females. For example, an Indigenous female who completes Year 12 was, across her life, estimated to have a probability of being employed full-time 2.24 times as high as one who did not complete Year 12.

The difference in lifetime income by education was generally higher for males than it was for females. When focussing on those who are employed and especially those who are employed full-time, the difference in lifetime income is similar for the Indigenous population compared to the non-Indigenous population, and on occasions less. For example, the IRR to completing Year 12 for someone employed full-time was estimated to be 10.0% for Indigenous males and 10.9% for non-Indigenous males. The results on the predicted benefits of education presented in this thesis are therefore in that respect quite similar to earlier work from Daly (1995) who found that it was entry into the labour market rather than remuneration once employed that education had the biggest impact on for Indigenous Australians.

Just as there is variation between the Indigenous and non-Indigenous populations in the predicted benefits of education, there is also variation within the Indigenous population. This may be because they are participating in quite different labour markets (remote versus non-remote Australia or CDEP versus non-CDEP employment) or because of other characteristics of the individual (disability, English language difficulties, having children). If Indigenous youth see themselves as being more likely to be in one of these subgroups as they get older, for example because of relatively high costs of mobility, then they may rely more on information from adults in that subgroup to estimate what the predicted benefits of education will be.

Those in remote areas have a lower predicted benefit of high school than those in non-remote areas. For those in both CDEP and non-CDEP employment, the predicted income benefits of high school education are low. This implies that for the Indigenous population, one of the biggest benefits of education is the ability to obtain non-CDEP employment. However, the predicted benefits of Year 12 are in fact higher for Indigenous males in the CDEP scheme compared to those in non-CDEP employment. This may be because those working in the CDEP scheme that have completed Year 12 may find it much easier to supplement their income from other employment compared to those who have not completed Year 12.

In general, the predicted employment and income benefits of education are higher for those with a disability than for those without a disability. This may be an indication of a high unobserved cost of education for those with a disability leading to education being concentrated amongst those with high ability. It may also be because those with a disability are not as well suited to some of the relatively high-paying but physical jobs that those who have not completed Year 12 have access to.

For those Indigenous males who report a difficulty communicating in English, the employment benefit of completing Year 10 or 11 is lower than those who do not report a difficulty, but the benefit of completing Year 12 is higher. For females, the reverse is the case with the benefits of Year 10 being higher but Year 12 lower. The predicted income benefits of education are, however, generally higher for those who do not report a difficulty in communicating in English, apart from those males employed full-time. This is a possible indication that English language ability and formal education are either self-productive or complementary (Cunha et al. 2006). That is, those with higher English language ability profit more from learning new skills or find learning these new skills less costly.

The predicted employment benefits of education are generally higher for those females without children or who have their children later in life. Furthermore, the predicted full-time benefits of education are very high for those without children. The predicted income benefits of education are also relatively low for those with children. This is especially the case for those females who have their children when they are young. Given a child's education participation and skills development is strongly influenced by their mother's education, it is important that these lower incentives to complete high school do not lead to poorer intergenerational outcomes.

Income and employment are not the only outcomes that are likely to be improved by completing education. For example, whether it is directly or indirectly, higher education levels have been found to be negatively associated with the probability of an Indigenous Australian having been arrested (Weatherburn, Snowball and Hunter 2006). Furthermore, Boughton (2000) found some evidence for a mother's education level improving the health outcomes of their children. There is also a large body of literature (on other populations) that there is a strong relationship between education and one's own health (Wolfe and Haveman 2001). If people anticipate these and other benefits, then they may be more likely to see education as being worthwhile.

Using seven binary measures of poor health (two traditional health outcomes and five health behaviours), the results discussed in this thesis confirmed that for Indigenous Australians, completion of high school is associated with better health outcomes. The magnitude of this association was not, however, consistent across the health measures. The largest differences were that those who had not completed high school were much more likely to report their health as being either fair or poor, were much more likely to report low levels of exercise, and were much more likely to be smokers (especially amongst the young). Interventions designed to improve health outcomes may therefore benefit from being targeted towards those with low education and, although it can not be confirmed without better data, increasing education levels in the population may have secondary effects on Indigenous health.

The Indigenous population live across a much wider geography than the non-Indigenous population. For example, Chapter 2 showed that while around 30% of the Indigenous population lived in major cities in 2001, this made up only 1.1% of the total population in these areas. In very remote Australia, on the other hand, Indigenous Australians made up 38.3% of the population. The resource endowments and types of labour markets are likely to be quite different in the less urbanised parts of Australia as is the relative supply and demand of skilled and unskilled labour. Given these differences, there is likely to be a different relationship between education and employment and income. If youth are more likely to use information from those around them to predict what the benefits of education might be (perhaps because of relatively high costs of mobility), then the incentives to complete high school and non-school qualifications might also vary.

Separate estimates of the predicted benefits of education across the five remoteness classifications based on the ARIA+ index were presented in Chapter 6. Quite high employment and full-time employment benefits of education were found for the Indigenous population in remote and very remote Australia especially when looking at the benefits of completing qualifications for those who did not complete Year 12. The income benefits of qualifications were quite high in very remote Australia, but those in remote Australia had similar predictions to those in outer regional areas. This probably reflects either the low supply of workers in these areas with qualifications and hence a premium placed on their wages or a high unobserved cost of education in these areas (for example social or transport costs).

The predicted benefits of completing high school were also estimated by a much smaller geography based on SLA. While the average predicted benefits of high school across Australia were similar to the estimates using national-level data for Indigenous and non-Indigenous males and females, there was substantially more variation across the regions for the Indigenous estimates. While this is not surprising given the lower numbers of Indigenous Australians in a number of regions, it does highlight the potential uncertainty for Indigenous youths in determining how economically worthwhile education is. Using such a small level of geography (there were 777 regions across Australia) also allowed an examination of the area-level factors that were associated with the predicted benefits of education.

Areas with a high proportion of the population employed in the government sector were associated with a lower predicted employment benefit of completing Year 12. However, there was a slightly higher income benefit in such areas. Agriculture, mining and manufacturing employment were also associated with lower benefits compared to employment in the services sector. Those Indigenous youth who live in areas where a high proportion of the population is employed in the CDEP scheme would predict a relatively low employment benefit of completing Year 12. Compared to the employment benefits, however, having a high proportion of the population employed in the CDEP scheme was associated with a higher income benefit of education.

For both the Indigenous and non-Indigenous population, those areas which had a low proportion of the population who had completed Year 12 had a higher predicted employment and income benefit of high school education. In these areas, either the unobserved costs of education are high, or the demand for the labour of those who have completed Year 12 is at least partly inelastic and hence the relatively low supply is leading to a wage premium.

9.2 Factors associated with education participation

The predicted benefits of education for the Indigenous population as measured in this thesis were generally as high as for the non-Indigenous population. There is substantial variation by population subgroup and geography and in Section 9.4 some possible policy implications of this variation are outlined. However, for the most part the incentives to undertake education seem to be reasonably large. It is not possible using the results in this thesis to reject the idea that there is a possible role for affirmative action and anti-discrimination legislation to reduce employment and income disparities as suggested by Carneiro, Heckman and Masterov (2003). However, that the incentives to undertake education are reasonably high, yet participation in education is relatively low, would suggest that there are a number of other factors that are making it harder or less worthwhile for Indigenous Australians to undertake education. This section summarises the results presented in Chapter 7 and 8 that looked at the factors associated with education participation.

9.2.1 Factors associated with high school participation

In Chapter 7 the factors associated with high school participation were analysed. Using the probability of a 15, 16 and 17-year-old attending high school as the main dependent variables, a set of individual and household factors were included as explanatory variables in the basic specification. In addition, four additional specifications were estimated, each with a different set of area-level factors as explanatory variables.

Whilst estimating the area-level factors associated with high school participation, it is important to control for the individual and household factors that may also have an association. Furthermore, these variables have their own important policy implications as discussed later in this chapter. Not surprisingly, the probability of attending high school decreases with age as the opportunity cost of education increases and the marginal benefit declines (as shown in Chapter 5 which amongst other things looked at the predicted benefit of education by year-level).

Those who identify as speaking English not well or not at all have a lower probability of attending high school than someone either who speaks English well or very well or who speaks English only. This is some evidence, therefore, that those with higher levels of ability find school either more difficult or less rewarding. Interestingly, for the Indigenous population identifying as a Torres Strait Islander was not associated with a significantly different probability of attending high school for males compared to those who identified as Aboriginal only. For females, there is a significant difference but the magnitude is quite small. The differences in the raw probabilities of attending are therefore likely to be because of the distribution of other characteristics.

The characteristics of a person's household were also found to be important. Education levels in the household generally had a significant positive association with the probability of attending high school; however, the type of education also had an impact (the marginal effects for Year 12 completion and degrees were particularly large). This highlights the potential inter-generational effects of education where those who have completed education themselves are more likely to see their children and other young members of their family undertake education.

The number of people in the household generally did not have a significant association with the probability of a youth living in that household attending high school. The number of people per bedroom did, however, have a negative association. This shows that household overcrowding rather than large households *per se* is a more important reason for Indigenous youth not going to school.

Chapter 7 looked at whether the proportion of the remainder of the 15 to 17-year-olds population who were attending school was associated with the probability of an individual attending high school themselves (after controlling for their individual and household characteristics). A strong positive correlation was found for all four demographic groups. Interestingly though, the size of the marginal effect was greatest for non-Indigenous males, perhaps giving some indication that the geographic areas as constructed by the ABS (and modified in this thesis) do not represent the social interactions that Indigenous Australians have as well as they do for the non-Indigenous population.

It is a little difficult to interpret such a variable, as a large part of the association may be caused by unobserved area-level characteristics. However, the positive association may be some indication that youths respond to the signals about how worthwhile education is that is sent to them by their peers. What the association does show, however, is that area-level characteristics matter.

The state or territory of usual residence was also significant. Living in Western Australia and Tasmania was associated with a lower probability of attendance than New South Wales for all the estimations, whereas the variables for South Australia, Queensland and the Australians Capital Territory were significantly higher. There is not that much difference in the probability of attending high school between major cities, inner regional areas and outer regional areas. Remote areas had a lower probability for males only, with the magnitude of the marginal effect quite high for Indigenous males. Very remote areas once again had a greater difference for males and Indigenous males in particular.

Results were also presented in Chapter 7 for the association with the proportion of two older cohorts of individuals in the area who had completed Year 12 or who had obtained qualifications (that is four variables in total). The proportion of 18 to 29-year-olds who had completed Year 12 has a positive association with attendance of 15 to 17-year-olds. The proportion of those aged 30 years and over did not seem to have that large an association (for the Indigenous population the variables were insignificant, for the non-Indigenous population the size of the marginal effect was small). This would imply that the high school experiences of this older generation are not as useful a guide for the younger generation (apart from those of the older generation in their household).

For Indigenous males, the proportion of the population aged 30 years and over who had qualifications had a large positive association with high school attendance. However, the proportion of the 18 to 29-year-olds population who had qualifications had a negative association. Given Chapter 2 showed that the Indigenous population are more likely to undertake qualifications later in life than the non-Indigenous population, these results would suggest that the additional education options that completing high school brings can be used as important motivations to continue on at school. However, Indigenous males especially see alternatives to high school education that may have lower social or economic costs or higher benefits and they may be using the experience of their immediate predecessors in the area as a guide for the alternative paths to take.

When the probability of attending any education is used as the dependent variable, the association with the proportion of the 18 to 29-year-old population who had qualifications was not significant for Indigenous males and had a positive association for Indigenous females. This shows that the experiences of this younger cohort do not draw youth away from all types of education, but rather influences the choice between high school or other qualifications.

The third set of area-level variables that were estimated against the probability of attending high school was the predicted benefits of education estimated at the local level (as analysed in Chapter 6). While the economic incentives for the non-Indigenous population were generally positive, significant and in some cases had quite large marginal effects, for the Indigenous population they were generally insignificant. This may be because there were too few other Indigenous Australians in each area for a youth to use as an accurate measure of what the benefits of education might be. Alternatively, it may be evidence that there are other things beyond the economic incentives to undertake education that are making education not seem worthwhile. The exception to this was the predicted employment benefits of education for Indigenous females. For this estimation, the variable had a significant positive association showing that there are certain economic incentives to undertake education that Indigenous Australians respond to.

Having a CDEP scheme in the area can also influence the economic and social incentives to undertake education. The fourth and final set of area-level variables that were modelled are whether there was a CDEP scheme in the area during the same year as the Census and the proportion of the ERP who were employed in the scheme. The first of these variables was found to have a significant negative association with Indigenous males and females attending high school, though once again there were differences by remoteness. The other positive aspects of the CDEP scheme, including community development, mean that the effect it appears to have on the incentives to undertake education should be put into context. Nonetheless, there is certainly evidence that those areas with the CDEP scheme present (and in major cities and regional areas those with high levels of participation) are likely to see fewer youth attending high school.

9.2.3 Factors associated with participation in preschool education

A large part of the difference in high school attendance between the Indigenous and non-Indigenous population analysed in Chapter 7 remained unexplained. This is not surprising, especially when using a data source that was not designed solely to undertake such analysis. One factor that featured heavily in the model developed in Chapter 3 that was not able to be taken into account adequately in Chapter 7 is a person's cognitive and non-cognitive ability. While the variable measuring self-reported English language proficiency gives some indication that lower ability youth are less likely to be attending school, this is only one small aspect of cognitive and non-cognitive ability.

Chapter 3 outlined research that found that high-quality early childhood education can have positive effects on skills development and school readiness. While it was not possible to include a measure of retrospective participation in early childhood education in the models in Chapter 7, it was possible to look at the factors associated with the current cohort of 3 to 5-year-olds attending preschool.

Unlike the estimates for high school attendance, the analysis of the factors associated with attending preschool by modelling the Indigenous and non-Indigenous populations together. This is because there has been no previous research looking at whether Indigenous and non-Indigenous children attend preschool at different rates after controlling for observable characteristics, whereas for high school students this is reasonably well established. After controlling for only a limited set of factors, an Indigenous 3-year-old is more likely to attend preschool than a non-Indigenous child of the same age. Although Indigenous 4 and 5-year-olds are less likely to attend after controlling for the same factors, the marginal effect of being Indigenous is less than the raw probabilities would suggest.

Separate estimates were also undertaken by Indigenous status (for 4 and 5-year-olds only) to see whether the factors associated with attendance varied. Not only are Indigenous children more likely to live in households with low incomes and families with low levels of education attainment, but the association with attendance for Indigenous children of these factors is even greater than for the non-Indigenous population. In addition, children who live in remote and very remote areas are less likely to attend preschool than those in regional areas and major cities. Indigenous children are doubly disadvantaged because they are much more likely to live in these areas and the effect of remoteness is greater for them.

The presence of a preschool worker who themselves identifies as Indigenous and is working in the area in which a child lives significantly increases attendance. There are likely to be other similar factors that were not available on the dataset used that show that the 'cultural inclusiveness' of the preschool has an important effect. Importantly, the presence of an Indigenous preschool worker had no association with the attendance of non-Indigenous children.

9.2.5 Factors associated with participation in non-government schools

Another reason why Indigenous Australians may have lower levels of ability when they reach late secondary school is the level of resources devoted to their education. Outside of school this is likely to be affected by socio-economic status, including the level of education in the household. Within schools, it may be influenced by the type of school that a child attends, including school sector. For example, Chapter 8 showed that Indigenous Australians had much lower rates of attendance at non-government schools which have been found in Australia to have higher rates of school completion than government schools. In analysing the factors associated with non-government school attendance, the probability of the base case Indigenous child or youth was substantially lower than an otherwise identical non-Indigenous child or youth. There were, however, a number of other factors that had a significant association.

Those who identified as being Catholic had a significant and quite large positive difference in attendance compared to other Christians, as well as other religious groups. Other individual factors also had a significant association with those who speak a language other than English having a higher probability of attendance. Interestingly, Indigenous children and youth in very remote Australia only have a slightly lower probability of attending non-government schools than those in major cities. This is most likely because the government school options in these areas are quite limited. Education levels in the household had a positive association as did income. This probably represents preferences for and access to non-government schools respectively.

9.3 Recommendations – Policy makers

The first recommendation that stems from the results in this thesis is that there are relatively high predicted employment and income benefits of completing education for Indigenous Australians and hence one of the most effective ways to reduce disparities in socio-economic outcomes into the future appears to be increasing education participation. While it was beyond the scope of this thesis to perform a decomposition analysis similar to Daly (1995) or Hunter (2004), the relatively high benefits of education suggest that the disparity in education achievement between Indigenous and non-Indigenous Australians is one of the main factors explaining the employment and income disparities outlined in Chapter 2.

The predicted income and employment benefits of education are high for both school and post-school education. Indeed, the difference between the benefits of education for Indigenous and non-Indigenous Australians is highest for non-degree qualifications. This not only partially explains why Indigenous Australians appear to have a relative preference for TAFE and other VET, but also highlights the importance of continuing to encourage and support Indigenous Australians who choose this option. This should not be done at the expense of school or university education, but rather as an alternative source of skills and training that appears to be rewarded in the labour market.

The health status of Indigenous Australians is also substantially worse than that of the non-Indigenous population. This is demonstrated most clearly by Indigenous life expectancy being roughly 17 years lower than for the non-Indigenous population (AIHW 2005). The results discussed in this thesis demonstrate that the predicted health benefits of education are quite high and hence an additional effect of increasing participation is likely to be improved health outcomes and health behaviour. Given the large levels of health expenditure that would be required to bring the standards of Indigenous health up to that of the non-Indigenous population, investing in Indigenous education appears to be a relatively cost effective complementary policy to reduce the human cost for those suffering from poor health.

Despite these high predicted benefits of education, that the participation rates of Indigenous youth are still relatively low shows that they are not responding at the national level to the incentives to undertake education. While this may be because of the other barriers to education outlined below, it may also be because the information that Indigenous youth use to gauge the benefits of education is lacking or incomplete. By estimating at a reasonably small geographical level, the results in this thesis have also shown that while on average predicted benefits are relatively high, because of a relatively high variance there are a number of areas where the predicted benefits are quite low.

There are a number of areas where there are few Indigenous Australians who have both completed Year 12 and have relatively high incomes. This may be because those with relatively high levels of income move out of a number of the areas in which Indigenous youth live. Hence, there are a number of areas in Australia where Indigenous youth may find it difficult to gauge what the predicted benefits of education are. Such information asymmetry has the potential to reduce the efficiency of education and labour markets and there is a definite role for governments, community organisations and schools to help Indigenous youth obtain the knowledge they need about the potential economic benefits of education. In other words, youth living in areas with relatively low economic incentives to complete Year 12 may need extra information or support to help them see that education is worthwhile. Furthermore, to encourage youth to go to school, it may also be beneficial to highlight the flow-on benefits of undertaking university education (which were also found to be quite high).

While information asymmetry is one possible reason why Indigenous youth are not responding to the reasonably high returns at the national level, it is also likely to be because of high costs of (or barriers) to education. These costs do not negate the benefits of increasing high school participation amongst the Indigenous population, as at the margin there are likely to be a number of youths who would benefit from going to school who at present are deciding not to. However, what it does show is that without reducing these costs or barriers, it is going to be quite difficult to increase attendance.

The results presented in this thesis show that a number of the costs of education are felt at the household level. One of the barriers to completing education is the lack of role models within the household who have had positive experiences with education. This is shown by those Indigenous youth who live in households with others who have completed education having a high probability of attending high school themselves. Importantly, while the association with education participation is not as strong with non-school qualifications as it is with high school or university education, the marginal effect for Indigenous males especially is still positive and reasonably large. This shows that increasing adult education even if it is through VET may have additional flow-on effects to the education participation of youths.

Interestingly, having an extra person in the household is not associated with a lower probability of an Indigenous youth attending school. However, the number of people per bedroom does have a negative association (and one that is relatively large). This shows that large households in and of themselves are not stopping Indigenous youth attending school, but rather it is the more specific issue of household overcrowding. This is an important distinction to make because, at least with regards to improving education participation, expanding the size of dwellings that Indigenous youth live in appears to be just as effective as increasing the number of houses.

Individual factors are also important in the decision of Indigenous youth to attend high school. Like the non-Indigenous population though to a slightly larger degree, otherwise identical Indigenous males are predicted to be less likely to be attending high school than females. This disparity is larger for 17-year-olds and to a lesser extent 16-years-olds than it is for 15-year-olds. Any strategies that attempt to encourage Indigenous youth to attend high school must certainly take into account the additional barriers Indigenous males face.

Despite Torres Strait Islander youth attending high school at much higher rates than the Aboriginal population, after controlling for other individual and household characteristics the probability is not significantly different for Indigenous males and small and only just significant for Indigenous females. This shows that one of the main reasons for Torres Strait Islanders attending at a higher rate is because of the somewhat higher socio-economic status of their families. However, the implication of this is that any policy responses designed to improve participation in education of Aboriginal Australians could be of equal benefit to Torres Strait Islanders of the same socio-economic status. The same could not be said for non-Indigenous Australians, as even after controlling for the individual and household characteristics, their high school attendance is still significantly higher.

The characteristics of the area in which an Indigenous youth lives are also associated with the probability of attending high school. However, while the state or territory in which an

Indigenous youth lives generally had a significant association, after controlling for this and other individual and household characteristics, the remoteness classification of the area did not have as large an association as the unadjusted proportions would suggest. While Indigenous males in very remote areas had a significantly lower probability than those in major cities, for the most part attendance rates were low across Australia. So, while a large amount of government attention is devoted to remote communities (at least at the Commonwealth Government level) this thesis has shown that improving educational attendance of those in regional areas and cities is equally important.

Not only are the characteristics of the areas significantly associated with high school attendance for individuals, so too are the characteristics of others that live in the area. For example, living in an area with a high proportion of the rest of the population aged 15 to 17 attending high school is associated with a higher probability for that individual attending high school. Importantly, this is after controlling for a large set of individual and household characteristics. This gives some support to the proposition that the behaviour of a person's geographic peers influences their own behaviour and hence encouraging one youth to stay on at school will have flow-on effects to others in the area.

While cross-sectional data does not allow a researcher to say definitively whether peer group effects act in this way (this is one area of research where natural experiments have been attempted in other contexts), it does show that characteristics of the area matter. That is, rather than geographic areas just being a collection of individuals influenced by their own or their household's characteristics, characteristics of the area affect individual outcomes. Any policy response to relatively low attendance at high school therefore needs to take into account geography.

Not only do Indigenous youth appear to be influenced by the education participation of their peers, they also appear to be influenced by the level of education of older cohorts in the area. That is, a number of Indigenous youth may not be attending high school because there are few role models in the area who have either completed high school themselves and/or gone on to alternative study options. While it is somewhat unrealistic to expect that those in their 20s and beyond can be encouraged to go back to school to complete their education, the results do show that any increase in the high school completion rate of the current generation of youth will have flow-on effects to future generations. Importantly, this is in addition to any influence they may have on children in their own household.

Although increasing the high school completion rates of adults may not be a realistic policy aim, encouraging them to obtain non-school qualifications was found to have potential positive effects on the education attendance of youth in the area at both high school and non-school options. So, in addition to any effect on their own outcomes, encouraging education attendance of elders in the community is likely to help youth in the area see education as being worthwhile.

One characteristic of areas that was found in this thesis to be associated with a lower probability of attending high school was the presence of the CDEP scheme. Across Australia, this negative association was generally found regardless of how many people were participating in the scheme. However, when estimated separately by remoteness classification, in regional areas it was the percentage of the ERP who were employed in the CDEP scheme that had the association.

There are a number of positive aspects of the CDEP scheme and it continues to have significant support from the Indigenous population. However, the possibility that the scheme would have such disincentives had previously been suggested by other authors (Hunter 2003) and appears to have been confirmed by results presented in this thesis. Hence, whilst attempting to maintain the positive aspects of the scheme this negative aspect can not easily be ignored.

The Commonwealth Government has recently announced decreases in the CDEP wage paid to workers under the age of 20 to bring them into line with youth allowance (DEWR 2006). As long as such changes do not significantly disadvantage those youth who rely on the CDEP scheme, they are likely to improve the relative economic incentives to undertake education as opposed to leave school and take up a CDEP position. However, an equally compelling argument could be made that it is the youth allowance itself that is too low and that should be increased instead.

An additional policy response could be to more thoroughly integrate CDEP participation with education activities, whether they are school-based or through the VET sector. That is, where such options are available, those of school age and other young adults who are on the CDEP scheme should be encouraged and supported to maintain closer links with education providers. Furthermore, those CDEP schemes that put greater emphasis on integrating educational qualifications with work on the CDEP scheme should be more favourably supported by the government.

The significant area-level effects give strong support for policy interventions that are either targeted towards certain areas (for example those with low predicted benefits of education) or that directly address the issue (for example by modifying the CDEP scheme). However, the evidence for encouraging the movement of people from areas with low predicted probabilities of attendance to ones with high predictions is more equivocal. Firstly, the overseas literature suggests that such policies do not always have consistent and long-term beneficial effects on educational attainment (Sanbonmatsu et al. 2006).

The second reason for being wary of encouraging people to move is that the results presented in this thesis show that those who moved areas in the five years preceding the Census had a lower probability of attending high school than those who did not. Furthermore, the size of the marginal effect was greater than the size of the marginal effect from a one standard deviation increase in any of the other area-level characteristics. In addition to showing that those students who do move may need extra support in overcoming the social costs of education, these results show that there may be offsetting effects of moving to take advantage of areas that are more conducive to education participation.

The final reason is that, because of the peer group effects discussed earlier, if those students who do move have a probability of attending school that is relatively high then there may be negative effects on those that stay in the area. That is, those who remain in the area could lose contact with students their own age who may help raise the social benefits of education, as well as a number of role models who would otherwise demonstrate the benefits of education.

These three points do not discount the potential benefits of encouraging migration entirely. For example, it may be possible to target those who would otherwise not be attending school leading to a beneficial effect on those that remain in the area. Rather, the point is that any policies that are based on encouraging students to move areas need to be wary of the negative and potentially offsetting disruptive effects of moving. Ideally such policies should be done on a pilot basis, preferably with some form of random allocation so that the effects can properly be tested.

Even after controlling for the range of individual, household and area-level factors discussed, the probability of an Indigenous youth attending high school is still below that of an otherwise identical non-Indigenous youth. One possible reason for this that is not captured by the Census is lower levels of cognitive and non-cognitive ability by the time they reach late secondary school. This would likely lead to continuing on at school being either more difficult or having lower benefits. One way in which Indigenous children's ability levels could be improved is through a better start to formal education by increased participation in preschool and other early childhood education programs.

For 3-year-olds, the results presented in this thesis show that after controlling for remoteness and the socio-economic status of families and households, Indigenous children are more likely to be attending preschool. For this age group, therefore, the key policy response would be the wider strategy of improving income and education levels in Indigenous families and households. Furthermore, additional research should be devoted to ensuring the quality of the education and care that Indigenous children receive in preschools is the same as that for the non-Indigenous population, and hence that the benefits to preschool education are consistent across the populations.

For 4 and 5-year-olds, however, otherwise identical Indigenous children have a lower probability of attending preschool than non-Indigenous children. One possible way in which preschool attendance for Indigenous 4 and 5-year-olds could be increased is by increasing the presence of preschool workers who themselves identify as being Indigenous. This, alongside greater involvement from Indigenous parents in the preschools as argued by Schwab and Sutherland (2003), would ensure that the somewhat unique needs of Indigenous children are being met.

In addition to the gap in preschool attendance, an additional reason for lower development of cognitive and non-cognitive ability for Indigenous compared to non-Indigenous children could be lower rates of attendance at non-government schools. Unlike attendance at preschool, however, the policy responses to this lower attendance is not as straightforward as simply increasing attendance levels. This is because as a child leaves the government sector, there may be detrimental peer group effects on those that remain. This is especially the case seeing as Ryan and Watson (2004) found that increases in non-government school enrolment over the last 30 years was made up primarily of those from relatively high socio-economic backgrounds. Therefore, if not done carefully, any increases in non-government school students will lead to fewer positive role models for those who remain in the government school sector. Either way, to improve the relative rates of high school attendance and completion of Indigenous Australians, some attention needs to be given to the large gap in non-government school attendance.

9.4 Recommendations – Data collectors and researchers

The collection, dissemination and analysis of statistics on Indigenous Australians is a vital part of understanding the circumstances in which they live and supporting the development of an evidence-based policy program that will improve their outcomes.

Indeed, it was the lack of information with which to support the work of the enquiry into Aboriginal deaths in custody that led to the 1994 NATSIS, the precursor to the 2002 NATSISS (Commonwealth of Australia 1991).

While analysis of empirical data should sit alongside research that probes more deeply into the circumstances and aspirations of Indigenous Australians, in their introductory chapter to Hunter (2006), Altman and Taylor (2006, p.11) identify the hope that statistics collected by the ABS 'would play a crucial role in clarifying both the causes and consequences of Indigenous disadvantage.' Furthermore, in the same volume, the Aboriginal and Torres Strait Islander Social Justice Commissioner, Tom Calma, discusses the 'importance and utility of Indigenous socioeconomic data in contributing to *improved enjoyment of human rights* by Indigenous peoples in Australia' (Calma 2006, p.299, emphasis in the original).

This thesis has relied heavily on official collections of data on Indigenous Australians and the previous section outlined a number of recommendations for policy-makers based on this analysis. However, it was not possible using the currently available data to answer every research question and hence it is useful to make recommendations for further avenues of research on the currently available data and areas where more extensive collection of data may be useful. The recommendations proposed are those that stem directly from the analysis undertaken for this thesis and hence mainly concern education and labour market data and research. This focus should not detract from other data gaps but should rather be seen as appealing to one aspect of a much larger collection strategy.

The recommendations made relate to three types of data: cross-sectional; longitudinal; and quasi-experimental. Cross-sectional data is that which relates to information at one particular point in time and individuals are surveyed only once. This type of data has provided the main source of information on Indigenous Australians, including in this thesis. While the range of cross-sectional data on Indigenous Australians is quite extensive (larger perhaps than for any other population subgroup of comparable size) there are a number of gaps in these data related to education and/or labour market outcomes as discussed in Section 9.4.1.

Longitudinal data tracks individuals with information collected two or more times throughout a person's life. The advantage of this type of data is that the factors associated with changes in a person's outcomes can be estimated. However, the disadvantage is that longitudinal datasets are generally more expensive to collect and the representativeness of the point in time information often decreases in later waves of data. There are a number of large-scale longitudinal data collections in Australia; however, the Indigenous sample collected in them is generally not robust or representative as discussed in Section 9.4.2.

The final type of data discussed is quasi-experimental data or natural experiments. Unlike in the medical or physical sciences, it is rare in the social sciences that the effect of a certain intervention can be tested by comparing the outcomes of a treatment group and a control group. Occasionally though, certain policy interventions affect one geographic group or cohort but not another in such a way that the before and after outcomes can be compared as if the two groups were randomly assigned. Such datasets are outlined in Section 9.4.3.

9.4.1 Cross-sectional information

While the range of cross-sectional information available on Indigenous Australians is quite wide, there are still a number of data gaps that can be identified from the analysis in this thesis. Firstly, although economists are usually wary of collecting attitudinal information, what Indigenous Australians perceive to be the benefits of education can best be collected by such data. With regards to economic incentives, replicating a similar survey to that reported in Dominitz and Manski (1996) on the Australian Indigenous population would give substantial insight into why Indigenous youth are attending high school at relatively low rates. More specifically, by combining the results with geographically-based economic incentives (like those presented in Chapter 6), a researcher would be able to test whether Indigenous youth are not responding to economic incentives like the non-Indigenous population do because their own estimates of predicted benefits are different or because they place greater importance on other factors when making their decision.

To support the above analysis of the perception of and response to economic incentives, a further gap in the cross-sectional data on Indigenous Australians is the other benefits of education that Indigenous youth think as being important. There is currently some information on this issue as outlined in Craven et al. (2005). In a survey of 517 Indigenous and 1,151 non-Indigenous students (in rural and urban areas), respondents were separately asked to rate how useful going to school, TAFE and university might be for helping them 'achieve what they want to do after leaving school.' Because of the range of additional information collected in the survey, one recommendation is for the unit record data to be made available for further analysis to complement that presented in Craven et al. (2005). Furthermore, similar types of questions that ask for more specific information on what the benefits of education are should also be considered for future surveys.

In addition to a person's perceptions of the benefits of education, an additional data item that has not been collected on large-scale surveys of Indigenous Australians is their cognitive and non-cognitive ability. Once again, there is some information. For example, in the survey reported in Craven et al. (2005) respondents are asked to rate their own feelings about themselves and school, including whether they feel they 'learn things quickly in most school subjects.' However, this information is collected only from those currently at school and does not include more objective measures of ability. Both types of information would be useful in testing whether cognitive and non-cognitive ability is associated with the decision to stay on at school. Such information may be available via administrative data; however, such data often does not have adequate socio-economic controls nor is it readily clear to outside researchers whether and how such information is available.

One factor that is likely to influence cognitive and non-cognitive ability is truancy or non-attendance at school for those who are currently enrolled. In the Census, all those aged 15 years and under are recorded as attending school. However, a number of students may not be attending school every day. This could be because they are doing so without permission. However, there may be other reasons like ill health that, although valid, could be reducing a person's skills development. Once again, some information on this topic is available at the aggregate level; however, unit record data on non-attendance would also open up a range of useful research questions.

9.4.2 Longitudinal information

One of the most common recommendations stemming from quantitative analyses of cross-sectional data is for similar data items to be collected in a longitudinal survey. This is not surprising because one of the criticisms of cross-sectional analysis is that the researcher is only able to test for associations rather than causation and they are not able to control for individual heterogeneity. However, longitudinal surveys are expensive to collect and administer. For example, the Longitudinal Study of Australian Children (LSAC) has a budget of $20.2 million over the nine years of the survey (AIFS 2002). Furthermore, because of sample attrition the cross-sectional information does not always remain representative in the later waves of the data. Hence, although longitudinal data collections are attractive for research purposes, any recommendations for their collection need to clearly identify a strong research need or consider ways in which quasi-longitudinal information can be added to cross-sectional collections.

The above should in no way be seen as detracting from the use such data would have in understanding the reasons for Indigenous socio-economic outcomes. Indeed, one recommendation from this thesis is that research on Indigenous education is pushing at the limits of cross-sectional data and many gains could be made with good quality longitudinal information. Rather, the point is that longitudinal information is expensive to collect and there is perhaps an even greater need in its collection for clearly articulating what research questions are trying to be answered. Furthermore, at the start of the collection cycle it is important to make sure that as many research questions as possible will be answerable, including those that may not yet have been considered.

One longitudinal study that may eventually turn out to be quite useful in the analysis of Indigenous education is the Longitudinal Study of Indigenous Children (LSIC). One of the facets of the LSIC that makes it unique (compared to say the LSAC) is that the questionnaire is likely to be different depending on the community in which it is being administered (FaCSIA 2006). That is, there is likely to be a structured interview with core questions asked consistently across Australia with additional questions asked that are of concern to the particular community. This methodology has the benefit of tailoring the information collected to local community needs. However, it does create greater pressure to ensure the questions that are asked of all or most of the respondents in Australia are not only well constructed, but also meet the major informational needs of the communities involved for comparative purposes.

One topic that this thesis has identified as requiring longitudinal information on, and hence one that should ideally be collected consistently in the core set of questions, is early childhood education. While the Census gives quite useful information on the factors associated with attendance at preschool, currently there is no information on whether and how Indigenous Australians are benefiting from preschool or other educational experiences before they reach school age. This is despite the large body of research in the USA that suggests early intervention is one of the most cost effective ways of reducing socio-economic disparities (Heckman and Masterov 2005). This thesis has also identified the presence of an Indigenous preschool worker in the area as being of the factors that is associated with whether an Indigenous child attends preschool. Given this, one set of questions in the LSIC that would be of particular use in supporting Indigenous communities is therefore whether there is an Indigenous worker in a child's preschool (which could be then tested against future outcomes) and what benefits parents of Indigenous children feel such workers bring to their children's education.

While the LSIC will likely prove quite useful in analysing the factors associated with the outcomes of Indigenous children (albeit well into the future), there are currently no longitudinal collections available or planned to look at the outcomes of Indigenous adults. One way to at least partially fill this gap is by including amongst the core set of questions on the LSIC a few key questions that collect information on the child's caregiver. To the extent that a child's caregiver remains the same through time, some analysis of the change in outcomes of the parents or guardians of Indigenous children would be possible.

The focus of the LSIC will and should remain on Indigenous children and hence the scope for analysis of youth or adults is limited. So, apart from the somewhat unrealistic option of commissioning a separate large scale longitudinal survey focussed on Indigenous adults, one option is to include an increased Indigenous component on pre-existing or planned surveys of the general population. For example any future Longitudinal Surveys of Australian Youth (LSAYs) could include an increased and representative sample of Indigenous youth.[85] In addition, the planned Statistical Longitudinal Census Dataset (SLCD) will combine information from a 5% sample of the 2006 Census with future Censuses (and possibly other datasets) and may allow some very interesting analysis of changes in Indigenous outcomes (Conn and Bishop 2006).

[85] The cross-sectional analogy to this is the 1995 and 2001 National Health Surveys which included an additional sample of Indigenous Australians from remote Australia.

However, the reliability of that information will be heavily influenced by the ability to successfully match the Indigenous component of the 5% sample through time.

An alternative to undertaking a large-scale longitudinal study (like the LSIC) is to link future administrative data to cross-sectional collections. For example, a survey that collected information on the attitudes, perceptions and experiences in high school education of a 13, 14 or 15-year-old could be linked to administrative data that contains information on whether that child completed high school. A researcher could then analyse whether the characteristics or attitudes of a child at the age of 13, 14 or 15 were associated with eventual school completion without having to track the individuals and re-survey them at the age of 17 or 18. That is 'the use of record linkage adds considerable value to the survey data without burdening respondents with extra questions' (Silburn et al. 2006, p.35).[86]

Information from two pre-existing cross-sectional surveys could also be used to construct quasi-longitudinal information. For example, one of the major changes between the 1996 and 2001 Censuses was the removal of the question on age left school and the introduction of a question on the highest year of school completed. While this new variable has made it possible to look at the predicted benefits of completing high school, it made it difficult if not impossible to look at changes in the predicted benefits of high school education through time. The recently completed 2006 Census, however, has a similar question to 2001 and hence when that data are released it will be possible to look at changes through time.

More specifically, having consistent questions between the 2001 and 2006 Censuses will allow two major additions to the analysis conducted in this thesis. Firstly, the researcher will be able to test whether changes in the predicted benefits of education at the local level are associated with education participation in the area or changes in education participation. With only one year of data available it was only possible to test whether the level of the predicted benefits of education were associated with the probability of

[86] Any attempt to collect such data would have to have stringent confidentiality assurances.

attendance. An analysis of the association with a change in the outcomes will better control for unobserved area-level heterogeneity. The second benefit of using the highest year of school completed question from both the 2001 and 2006 Censuses is that it will enable an analysis of the relationship between education completion and employment/income that takes into account cohort information. This will result in more accurate estimates of labour market experience and forecasts of whether and how income will increase into the future.

9.4.3 Quasi-experimental data or natural experiments

The final type of data that could be utilised to gain additional insight into participation in and outcomes of education is quasi-experimental data or natural experiments. This type of data takes advantage of policy changes that affect one geographic group or cohort but not another. If these groups are otherwise identical then the policy intervention can be treated in a similar way to a traditional experiment where one group is randomly assigned to receive a treatment whereas another is set as the control group. These natural experiments are never going to be as clean as designed experiments. For example, those in the control group can not realistically be administered a placebo policy intervention. However, they do allow the researcher to control to a certain extent for unobserved individual heterogeneity.

A good explanation and set of examples of the use of natural experimental data regarding returns to education in Australia can be found in Leigh and Ryan (2005). The three natural experiments used are month of birth, compulsory schooling laws and comparing twins. The authors find that the returns to schooling corrected for ability bias is around 10%, though this varies across the three estimation methodologies. This is comparable to the returns estimated using OLS of 12%. For the Indigenous population, the predicted benefits of completing Year 12 are somewhat higher than 12%. Given the low levels of education in the Indigenous population, the model outlined in Chapter 3 suggests that the higher than average predicted benefits of education could be caused by a substantial ability bias. Hence there is the potential to replicate such analysis on the Indigenous population if similar datasets were available.

Similar to the use of cross-sectional and longitudinal information, administrative data would be quite useful in analysing natural experiments. However, the issue that arises is that without having well-established contacts within the departments that hold the data, it is difficult to know what is available or how to access the data for research purposes. One potential way to deal with this is for there to be an online repository of information on all the administrative collections that are available in Australia for research purposes. This could be constructed in a similar way to the Australian Social Science Data Archive or the Economic and Social Data Service that act as a source of information and repository for survey data in Australia and the UK respectively.[87]

There are additional confidentiality requirements that are associated with analysing administrative data so it would not be realistic to keep the data itself on such a website. Rather, for each collection the information contained, and more importantly how to obtain access, could be made publicly available and transparent. This will remove the potential for information to be only available to insiders and hence greatly expand the scope for social science research in Australia and the development of evidence-based policy.

There are a number of policy interventions currently being targeted towards improving Indigenous outcomes that may also be amenable to analysing as a quasi or natural experiment. For example, one that is discussed in Chapter 8 is the Higher Expectations Program currently being coordinated by the CYI. If an element of randomness was incorporated into who is affected by these interventions then significant insight could be gained into how effective they are and how they can be improved in the future. For example, the Perry Preschool Project in the USA has been used by a number of researchers to look at the effectiveness of quality early childhood education.[88]

---

[87] For more information see http://assda.anu.edu.au/ and http://www.esds.ac.uk/ respectively.
[88] For more information see http://www.highscope.org/Research/PerryProject/perrymain.htm

9.5 Summary and contribution to the literature

This thesis has made a number of contributions to the literature on participation and outcomes of education for the Indigenous Australian population. Building on a HCM that was specifically developed for the Indigenous population, a range of income, employment and health benefits of education were presented and, for the first time, these were allowed to vary by small levels of geography and by a number of population subgroups. One of the most important implications from these results is the potential to reduce the employment, income and health disparities between the Indigenous and non-Indigenous populations by increasing participation in high school and post-school education.

Despite the likely benefits of education for the Indigenous population, Indigenous youth do not appear to be wholly responding to the economic incentives either at the national or the local level. By estimating the association between high school education participation and a number of individual, household and area-level variables, new insight is gained into a number of barriers to education for the Indigenous population. Some which were discussed in this thesis include the social costs of education and low socio-economic status at the household level including education, access to economic resources and household overcrowding.

These barriers to education participation are likely to not only affect students in their late teens but are also likely to affect cognitive and non-cognitive skills development throughout their schooling. This is especially the case given the relatively low participation in preschool and disparate access to non-government schools discussed in this thesis as well as the school level issues documented in Schwab (1999). Therefore, without reducing these barriers to education, Indigenous Australians are unlikely to be able to make use of the improved capabilities and levels of wellbeing that education has to offer.

References

ABS (Australian Bureau of Statistics) (2000), *How Australia Takes a Census*, ABS cat. no. 2903.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2001a), *2001 Census Dictionary*, ABS cat. no. 2901.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2001b), *Statistical Geography Volume 1 Australian Standard Geographical Classification (ASGC)*, ABS cat. no. 1216.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2002a), *Population Distribution: Aboriginal and Torres Strait Islander Australians 2001*, ABS cat. no. 4705.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2002b), *Year Book Australian 2002: Early years education in Australia*, ABS cat. no. 1301.0.2002, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2003a), *National Health Survey: Users' Guide, 2001*, ABS cat. no. 4363.0.55.001, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2003b), *Child Care Australia*, ABS cat. no. 4402.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2004a), *National Aboriginal and Torres Strait Islander Social Survey* ABS cat.no. 4714.0, ABS, Canberra

ABS (Australian Bureau of Statistics) (2004b), *Census of Population and Housing: socio-Economic Index for Areas (SEIFA), Australia – Technical Paper 2001*, ABS cat. no. 2039.0.55.001, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2004c), *Australian Social Trends: Attending Preschool*, ABS cat. no. 4102.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2005), *National Aboriginal and Torres Strait Islander Social Survey Confidentialised Unit Record File Technical Paper*, ABS cat. no. 4720.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2006a), *Schools Australia*, ABS cat. no. 4221.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2006b), *How Australia Takes a Census*, ABS cat. no. 2903.0, ABS, Canberra.

ABS (Australian Bureau of Statistics) (2007), *Average Weekly Earnings, Australia: November 2006*, ABS cat. no. 6302.0, ABS, Canberra.

AIFS (Australian Institute of Family Studies) (2002), *Introducing the Longitudinal Study of Australian Children*, LSAC Discussion Paper No.1, AIFS, Melbourne.

AIHW (Australian Institute of Health and Welfare) (2005), *The Health and Welfare of Australia's Aboriginal and Torres Strait Islander Peoples 2005*, AIHW cat. no. IHW-14.

Akerlof, G.A. and Kranton, R.E. (2002), 'Identity and Schooling: Some Lessons for the Economics of Education', *Journal of Economic Literature* **40**(4), 1167-1201.

Altman, J.C. (2005), 'Development options on Aboriginal land: Sustainable Indigenous hybrid economies in the twenty-first century', in L. Taylor, G.K. Ward, G. Henderson, R. Davis and L.A. Wallis (eds), *The Power of Knowledge, The Resonance of Tradition*, Aboriginal Studies Press, Canberra.

Altman J.C., Biddle, N. and Hunter B.H. (2005), 'Indigenous socio-economic change 1971-2001: A historical perspective', *Australian Economic History Review* **45**(3), 273-295.

Altman J.C., Buchanan G. and Biddle, N. (2006), 'Measuring the 'Real' Indigenous Economy in Remote Australia Using NATSISS 2002', *Australian Journal of Labour Economics* **9**(1), 17-31.

Altman, J.C., Gray, M.C. and Levitus, R. (2005), *Policy issues for the community development employment projects scheme in rural and remote Australia*, CAEPR Discussion Paper No. 271, CAEPR, ANU, Canberra.

Altman, J. C. and Nieuwenhuysen, J. (1979), *The Economic Status of Australian Aborigines*, Cambridge University Press, Cambridge.

Altman, J.C. and Taylor, J. (2006), 'Statistical needs in Indigenous affairs: the role of the 2002 NATSISS', in Hunter, B.H. (ed), *Assessing the evidence on Indigenous socioeconomic outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, CAEPR, ANU, Canberra.

Arrow, K.J. (1973), 'Higher education as a filter', *Journal of Public Economics* **2**(3), 193-216.

Austen-Smith. D. and Fryer. R.G. (2005), 'An economic analysis of 'Acting White'', *Quarterly Journal of Economics* **120**(2), 551-583.

Bainbridge, J., Meyers, M., Tanaka S. and Waldfogel, J. (2005), 'Who gets an early education? Family income and the enrollment of 3- to 5-Year-olds from 1968 to 2000', *Social Science Quarterly* **86**(3), 724-745.

Baker, J. (2001), 'The scope for reducing Indigenous imprisonment rates', *Crime and Justice Bulletin* **55**, 1-10.

Barnett, W.S. (1995), 'Long-Term Effects of Early Childhood Programs on Cognitive and School Outcomes', *The Future of Children* **5**(3), 25-50.

Barnett, W.S. (1998), 'Long-Term Cognitive and Academic Effects of Early Childhood Education on Children in Poverty', *Preventive Medicine* **27**, 204-207.

Baumeister, R.F. and Muraven, M. (1996), 'Identity as adaptation to social, cultural and historical context', *Journal of Adolescence* **19**, 405-416.

Becker, G. S. (1964), *Human capital*, National Bureau of Economic Research, New York.

Belman, D. and Heywood, J.S. (1991), 'Sheepskin Effects in the Returns to Education: An examination of Women and Minorities', *The Review of Economics and Statistics* **73**(4), 720-724.

Belzil, C. and Hansen, J. (2002), 'Unobserved Ability and the Return to Schooling', *Econometrica* **70**(5), 2075-2091.

Biddle, N. (2005), 'Health benefits of education in Australia: Indigenous/non-Indigenous comparisons', Presented at the *Australian Social Policy Conference*, Sydney, July 2005.

Biddle, N. (2006a), The labour market status of Australian students: Who is unemployed, who is working and for how many hours?, Unpublished Masters Thesis, Monash University.

Biddle, N. (2006b), 'The Association Between Health and Education in Australia: Indigenous/Non-Indigenous Comparisons', *The Economic and Labour Relations Review* **17**(1), 107-142.

Biddle, N. (2006c), 'The age at which Indigenous Australians undertake qualifications: A descriptive analysis', *Australian Journal of Adult Learning* **46**(1), 28-50.

Biddle, N. (2006d), 'Is it worth going to school? Variation in the predicted benefits of education for Indigenous Australians', *Australian Journal of Labour Economics* **9**(2), 173-199.

Biddle, N. (2006e) 'If I finish school will it help me get a job? Variation in predicted benefits of education by geography and Indigenous status', Presented at the *Australasian Meeting of the Econometric Society*, Alice Springs, July 2006.

Biddle, N. and Hunter, B.H. (2006a), *Factors associated with internal migration: A comparison between Indigenous and non-Indigenous Australians*, CAEPR Working Paper No. 32, CAEPR, ANU, Canberra.

Biddle, N. and Hunter, B. H. (2006b), 'A note on the geography and dynamics of local CDEP scheme rates, 1999 to 2004', Unpublished mimeo available online at http://www.anu.edu.au/caepr.

Biddle, N. and Hunter, B.H. (2006c), 'Selected methodological issues for analysis of the 2002 NATSISS', in Hunter, B.H. (ed), *Assessing the evidence on Indigenous socioeconomic outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, CAEPR, ANU, Canberra.

Biddle, N., Hunter B.H. and Schwab, R.G. (2004), *Mapping Indigenous educational participation*, CAEPR Discussion Paper No. 267, CAEPR, ANU, Canberra.

Biddle, N. and Webster, A. (2007), 'The labour force status of Aboriginal and Torres Strait Islander Australians', Presented at the *Australian Labour Market Research (ALMR) Workshop*, Melbourne, February 2007.

Blackburn, M.L. and Neumark, D. (1993), 'Omitted-Ability Bias and the Increase in the Return to Schooling', *Journal of Labor Economics* **11**(3), 521-544.

Boocock, S.S. (1995), 'Early Childhood Programs in Other Nations: Goals and Outcomes', *The Future of Children* **5**(3), 94-114.

Booth, A. and Carroll, N. (2005), *The Health Status of Indigenous and Non-Indigenous Australians*, Centre for Economic Policy Research Discussion Paper No. 486, ANU, Canberra.

Borland, J. (2002), *New estimates of the private rate of return to university education in Australia*, University of Melbourne Working Paper No. 14/02.

Boughton, B. (2000), 'What is the connection between Aboriginal education and Aboriginal health', *Cooperative Research Centre for Aboriginal and Tropical Health Occasional Paper Series*, Issue 2.

Bourke, C.J., Rigby, K. and Burden, J. (2000), *Better practice in school attendance: Improving the school attendance of Indigenous students*, Report prepared for the Analysis and Equity Branch, Department of Education, Training and Youth Affairs, Canberra.

Breen, R. and Goldthorpe, J.H. (1997), 'Explaining Educational Differentials: Towards a Formal Rational Action Theory', *Rationality and Society* **9**(3), 275-305.

Brooks-Gunn, J. and Duncan, G.J. (1997), 'The Effects of Poverty on Children', *The Future of Children* **7**(2), 55-71.

Brough, M. (2006), 'Blueprint for Action in Indigenous Affairs', Speech to the National Institute of Governance, 5 December 2006 (last viewed 13 December 2006) http://www.atsia.gov.au/media/speeches06/05_12_06.aspx.

Burgess, J., Mitchell, W. and Preston, A. (2003), 'The Australian Labour Market in 2002' *The Journal of Industrial Relations* **45**(2), 125-150.

Butterworth, D. and Candy, J. (1998), 'Quality early childhood practice for young Aboriginal Children', *Australian Journal of Early Childhood* **23**(2), 20-25.

Calma, T. (2006), 'Social justice and human rights: using Indigenous socioeconomic data in policy development', in Hunter, B.H. (ed), *Assessing the evidence on Indigenous socioeconomic outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, CAEPR, ANU, Canberra.

Capizzano, J., Adams, G. and Sonenstein, F. (2000), *Child Care Arrangements for Children Under Five: Variation Across States*, Urban Institute, Washington, DC.

Card, D. (2001), 'Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems', *Econometrica* **69**(5), 1127-1160.

Carneiro, P. and Heckman, J.J. (2003), 'Human Capital Policy', in Heckman, J.J., Krueger, A.B. and Friedman, B.M. (eds), *Inequality in America: What Role for Human Capital Policies?*, MIT Press, Cambridge, MA.

Carneiro, P., Heckman, J.J. and Masterov (2003) 'Understanding the Sources of Ethnic and Racial Wage Gaps and Their Implications For Policy' Presented at the *ABF conference Rights and Realities: Legal and Social Scientific Approaches to Employment Discrimination*, Stanford University Law School, March 2003

Caughy, M. O., DiPietro, J. A. and Strobino, D. M. (1994), 'Day-care participation as a protective factor in the cognitive development of low income children', *Child Development* **65**(2), 457-471.

Cawley, J., Heckman, J.J. and Vytlacil, E.J. (2001), 'Three Observations on Wages and Measured Cognitive Ability', *Labour Economics* **8**(4), 419-442.

Centrelink (2006a), *Education Payment Rates*, Centrelink cat. no. CO033.0607.

Centrelink (2006b), *Youth Payment Rates*, Centrelink cat. no. CO035.0607.

Chapman, B. and Gray, M. (2006), 'Labour market issues', in Hunter, B.H. (ed), *Assessing the evidence on Indigenous socioeconomic outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, CAEPR, ANU, Canberra.

Chapman, L. and Greenville, J. (2002), 'Profiling rural Australia: Impact of changes in the agriculture sector on rural towns', *Australian Commodities* **9**(1), 234-249.

Chikritzhs, T. and Brady, M. (2006), 'Substance use in the 2002 NATSISS', in Hunter, B.H. (ed), *Assessing the evidence on Indigenous socioeconomic outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, CAEPR, ANU, Canberra.

Chiswick, B.R. and Miller, P.W. (1995), 'The Endogeneity between Language and Earnings: International Analyses', *Journal of Labor Economics* **13**(2), 246-288.

Collins, B. (1999), *Learning Lessons: An Independent Review of Indigenous Education in the Northern Territory*, Northern Territory Department of Education, Darwin.

Commonwealth of Australia (1991), *Royal Commission into Aboriginal Deaths in Custody, vol. 2* AGPS, Canberra.

Conn, L. and Bishop, G. (2006), *Exploring Methods for Creating a Longitudinal Census Dataset*, ABS cat. no. 1352.0.55.076, ABS, Canberra.

Cook, P.J. and Ludwig, J. (1998), 'The Burden of "Acting White": Do Black Adolescents Disparage Academic Achievement' in Jencks, C. and Phillips, M. (eds), *The Black-White Test Score Gap*, Brookings Institute Press, Washington D.C.

Coombs, H. C. (1972), 'The Employment Status of Aborigines', *Australian Economic Papers* **11**(18), 8-18.

Cox, D. (1990), 'Intergenerational Transfers and Liquidity Constraints', *The Quarterly Journal of Economics* **105**(1), 187-217.

Craven, R., Tucker, A., Munns, G., Hinkley, J., Marsh, H. and Simpson, K. (2005), *Indigenous students' aspirations: Dreams, perceptions and realities*, AGPS, Canberra.

Crimmins, E.M. and Saito, Y. (2001), 'Trends in healthy life expectancy in the United States 1970-1990: gender, racial and education differences', *Social Science and Medicine* **52**, 1629-1641.

Cunha, F., Heckman, J.J., Lochner, L. and Masterov, D.V. (2006), 'Interpreting the Evidence on Life Cycle Skill Formation', in Hanushek, E. and Welch, F., *The Handbook of the Economics of Education*, Elsevier Science, Amsterdam.

CYI (Cape York Institute for Policy and Leadership) (2006), *Higher Expectations Program*, (last viewed 8 January 2007) http://www.cyi.org.au/hep.aspx.

Dahl, G. B. (2002), 'Mobility and the Return to Education: Testing a Roy Model with Multiple Markets', *Econometrica* **70**(6), 2367-2420.

Daly. A.E. (1995), *Aboriginal and Torres Strait Islander People in the Australian Labour Market: 1986 and 1991*, ABS cat. no. 6253.0, ABS, Canberra.

Daly, A. E. and Liu, J. (1995), *Estimating the private rate of return to education for Indigenous Australians*, CAEPR Discussion Paper No. 97, CAEPR, ANU, Canberra.

De Bortoli, L. and Cresswell, J. (2004), *Australia's Indigenous Students in PISA 2000: Results from an International Study*, ACER Research Monograph No. 59, Australian Council for Educational Research, Camberwell.

DEST (Commonwealth Department of Education, Science and Training) (2003), *National Report to Parliament on Indigenous Education and Training, 2002*, AGPS, Canberra.

DEST (Commonwealth Department of Education, Science and Training) (2005), *National Report to Parliament on Indigenous Education and Training, 2003*, AGPS, Canberra.

DEST (Commonwealth Department of Education, Science and Training) (2006), *National Report to Parliament on Indigenous Education and Training, 2004*, AGPS, Canberra.

DEWR (Commonwealth Department of Employment and Workplace Relations) (2005), *Building on success: CDEP – Future directions*, AGPS, Canberra.

DEWR (Commonwealth Department of Employment and Workplace Relations) (2006), *Indigenous Potential meets Economic Opportunity*, AGPS, Canberra.

Dodson, M. (2006), *Address to the Reconciliation: Taking the Next Step Luncheon*, (last viewed 21 February 2007) http://www.reconciliation.org.au/downloads/156/Mick_Dodson_25July.pdf.

Dominitz, J. and Manski, C.F. (1996), ‘Eliciting student expectations of the returns to schooling’, *Journal of Human Resources* **31**(1), 1-26.

Duckworth, A.L. and Seligman, M.E.P. (2005), ‘Self-Discipline Outdoes IQ in Predicting Academic Performance of Adolescents’, *Psychological Science* **16**(12), 939-944.

Durlauf, S.N. (2004), ‘Neighborhood Effects’, in Henderson, J.V. and Thisse, J.-F. (eds), *Handbook of Regional and Urban Economics, volume 4*, Elsevier B.V., Amsterdam.

Edwards, R.C. (1976), ‘Individual Traits and Organizational Incentives: What Makes a ‘Good’ Worker?’, *Journal of Human Resources* **11**(1), 51-68.

Eide, E. and Showalter, M.H. (1998), ‘The effect of school quality on student performance: A quantile regression approach’, *Economics Letters* **58**, 345-350

Encel, J. D. (2000), *Indigenous Participation in Higher Education*, Occasional Paper Series 00/C, Department of Education, Training and Youth Affairs, Canberra.

FaCSIA (Commonwealth Department of Family, Community Services and Indigenous Affairs) (2006), *2006 Directions for Footprints in Time: A Longitudinal Study of Indigenous Children*, (last viewed 28 December 2006) http://www.facsia.gov.au/internet/facsinternet.nsf/vIA/lsic/$File/overview_jul06.pdf.

Ferguson, R.F. (1998), ‘Teachers’ Perceptions and Expectations and the Black-White Test Score Gap’, in Jencks, C. and Phillips, M. (eds), *The Black-White Test Score Gap*, Brookings Institute Press, Washington D.C.

Ferson, M.J. (1997), ‘Infection control in child care settings’, *Communicable Diseases Intelligence* **21**(22), 333-337

Fordham, S. and Ogbu, J. (1986), ‘Black Students’ School Success: Coping with the Burden of Acting White’, *The Urban Review* **18**, 176–206.

Frederick, S., Loewenstein, G. and O’Donoghue, T. (2002), ‘Time Discounting and Time Preference: A Critical Review’, *Journal of Economic Literature* **40**(2), 351-401.

Fryer, R. and Levitt, S. (2004), ‘Understanding the Black-White Test Score Gap in the First Two Years of School’, *Review of Economics and Statistics* **86**(2), 447-464.

Fryer, R. and Levitt, S. (2006), *Testing for Racial Differences in the Mental Ability of Young Children*, NBER Working Paper No. 12066, NBER, Cambridge.

Gardner, H. and Hatch, T. (1989) ‘Multiple Intelligences Go to School: Educational Implications of the Theory of Multiple Intelligences’, *Educational Researcher* **18**(2), 4-10.

Gee, J.P. (1991), ‘What is Literacy?’, in Mitchell, C. and Weiler, K. (eds), *Rewriting Literacy: Culture and the Discourse of the Other*, Bergin and Garvey, New York.

Gilleskie, D.B. and Harrison, A.L. (1998), ‘The effect of endogenous health inputs on the relationship between health and education’, *Economics of Education Review* **17**(3), 279-297.

Ginther, D., Haveman, R. and Wolfe, B. (2000), 'Neighborhood Attributes as Determinants of Children's Outcomes: How Robust Are the Relationships?', *The Journal of Human Resources* **35**(4), 603-642.

GISCA (National Centre for Social Applications of GIS) (2006), *About ARIA+ (Accessibility/Remoteness Index of Australia)*, (last viewed 5 November 2006) http://www.gisca.adelaide.edu.au/products_services/ariav2_about.html.

Gray, A. and Boughton, B. (2001), 'Education and health behaviour of Indigenous Australians: evidence from the 1994 National Aboriginal and Torres Strait Islander Survey (NATSIS)', *Cooperative Research Centre for Aboriginal and Tropical Health Occasional Paper Series* **3**.

Gray, M.C., Altman, J.C. and Halasz, N. (2005), *The economic value of wild resources to the Indigenous community of the Wallis Lake catchment*, CAEPR Discussion Paper No. 272, CAEPR, ANU, Canberra.

Gray, M.C., Hunter, B.H. and Schwab, R.G. (2000), 'Trends in Indigenous educational participation and attainment, 1986–96', *Australian Journal of Education* **44**(2), 125-146.

Halchuk, P. (2006), 'Measuring Employment Outcomes for Indigenous Australians', *Australian Journal of Labour Economics* **9**(2), 201-216.

Harris, J.R. and Todaro, M.P. (1970), 'Migration, unemployment and development: A two-sector Analysis', *American Economic Review* **60**(1), 126-142.

Heckman, J.J., Lochner, L.J. and Todd, P.E. (2005), *Earnings functions, rates of return, and treatment effects: The Mincer Equation and beyond*, NBER Working Paper No. 11544, National Bureau of Economic Research, Massachusetts.

Heckman, J.J. and Masterov, D.V. (2005), *The Productivity Argument for Investing in Young Children*, http://jenni.uchicago.edu/Invest/.

Heckman, J.J., Stixrud, J. and Urzua, S. (2006), *The effects of cognitive and noncognitive abilities on labor market outcomes and social behaviour*, NBER Working Paper No. 12006, National Bureau of Economic Research, Massachusetts.

Hendricks, C.M., Echols, D. and Nelson, G.D. (1989), 'The impact of a preschool health curriculum on children's health knowledge', *The Journal of School Health* **59**(9), 389-92.

Henry, K. (2006), 'Managing Prosperity: Address to the 2006 Economic and Social Outlook Conference', *Economic Roundup* **Spring 06**, 7-16.

Hirschman, C., Lee., J.C. and Emeka, A.S. (2003), 'Explaining Race and Ethnic Disparities in Educational Ambitions', Paper presented at the *University of Washington Workshop on 'The UW Beyond High School in Washington State Project'*.

Hollenbeck, K. and Kimmel, J. (2001), *The Returns to Education and Basic Skills Training for Individuals with Poor Health or Disability*, Upjohn Institute Staff Working Paper No. 01-72.

Huggins, J. (2006), *Health and education: Inextricably linked*, Garma Festival, Gulkula, August 2006.

Hull, R. and Edsall, S. (2001), *No small matter: Quality preschools benefit children and society*, Australian Education Union, Melbourne.

Hungerford, T. and Solon, G. (1987), 'Sheepskin Effects in the Returns to Education', *The Review of Economics and Statistics* **69**(1), 175-177.

Hunter, B.H. (2003), 'The Rise of the CDEP Scheme and Changing Factors Underlying Indigenous Male Employment', *Australian Journal of Labour Economics*, **6**(3), 473-496.

Hunter, B.H. (2004), *Indigenous Australians in the contemporary labour market*, ABS cat. no. 2052.0, ABS, Canberra.

Hunter, B.H. (2005), *A Tale of Two Nations: The Divergent Pathways for Indigenous Labour Force Outcomes in Australia and New Zealand Since 1991*, CIGAD Working Paper Series, No. 7/2005.

Hunter, B.H. (ed) (2006), *Assessing the evidence on Indigenous socioeconomic outcomes: A focus on the 2002 NATSISS*, CAEPR Monograph No. 26, CAEPR, ANU, Canberra.

Hunter, B.H. and Borland, J. (1999), 'The effect of arrest on indigenous employment prospects', *Crime and Justice Bulletin* **45**, 1-8.

Hunter, B.H. and Dungey, M.H. (2003), *Creating a sense of 'closure': Providing confidence intervals on some recent estimates of Indigenous populations*, CAEPR Discussion Paper No. 244, CAEPR, ANU, Canberra.

Hunter, B.H. and Schwab, R.G. (1998), *The Determinants of Indigenous Educational Outcomes*, CAEPR Discussion Paper No. 160, CAEPR, ANU, Canberra.

Jencks, C. and Phillips, M. (eds) (1998), *The Black-White Test Score Gap*, Brookings Institute Press, Washington D.C.

Jensen, B. and Seltzer, A. (2000), 'Neighbourhood and Family Effects in Educational Progress', *The Australian Economic Review* **33**(1), 17-31.

Johns. G. (2006), *Aboriginal education: Remote schools and the Real economy*, Menzies Research Centre, Barton.

Johnson, P. and Lloyd, R. (2000), 'Does higher education pay? Results from the returns to education model' Presented at the *Conference of Economists*, Gold Coast, July 2000.

Junankar, P. N. and Liu, J. (2003), 'Estimating the social rate of return to education for Indigenous Australians', *Education Economics* **11**(2),169-192.

Kennedy, S. (2002), *The relationship between education and health in Australia and Canada*, SEDAP Research Paper No. 93.

Kral, I. and Schwab, R.G. (2003), *The realities of Indigenous adult literacy acquisition and practice: Implications for capacity development in remote communities*, CAEPR Discussion Paper No. 257, CAEPR, ANU, Canberra.

Kronemann, M. (1998), *Towards a national plan for preschool education*, Australian Education Union, Melbourne.

Lamb, S., Walstab, A., Teese, R., Vickers, M. and Rumberger, R. (2004), *Staying on at school: Improving student retention in Australia*, Queensland Department of Education and the Arts, Brisbane.

Le, A.T. and Miller, P.W. (2003), 'Choice of School in Australia: Determinants and Consequences', *The Australian Economic Review* **36**(1), 55-78

Leigh, A. and Ryan, C. (2005), *Estimating Returns to Education: Three Natural Experiment Techniques Compared*, CEPR Discussion Paper No. 493, CEPR, ANU, Canberra.

Lleras-Muney, A. (2005), 'The relationship between education and adult mortality in the United States', *The Review of Economic Studies* **72**(1), 189-221.

Long, L.H. (1992), 'Changing Residence: Comparative perspectives and its relations to age, sex and marital status', *Population Studies* **46**(1), 141-158.

Magnuson, K.A., Meyers, M.K. and Waldfogel, J. (2007) 'Public Funding and Enrollment in Formal Child Care in the 1990s' *Social Science Review* **81**, 47-83

Martin, D.F., Morphy, F., Sanders, W.G. and Taylor, J. (2002), *Making Sense of the Census: Observations of the 2001 Enumeration in Remote Aboriginal Australia*, CAEPR Monograph No. 22, CAEPR, ANU, Canberra.

Masse, L.N. and Barnett, W.S. (2002), *A benefit cost analysis of the Abecedarian Early Childhood Intervention,* National Institute for Early Education Research, New Jersey

McConnochie, K.R., and Russell, A. (1982), *Early childhood services for Aboriginal Children,* AGPS, Canberra

MCEETYA (Ministerial Council on Education, Employment, Training and Youth Affairs) (2001), *Solid Foundations: Health and Education Partnership for Indigenous Children aged 0 to 8 Years*, MCEETYA Discussion Paper, Carlton.

Mellor, E.J. (1990), *Stepping Stones: The development of early childhood services in Australia*, Harcourt Brace Jovanovich, Sydney

Miller, P. W. (1989), 'The Structure of Aboriginal and non-Aboriginal Youth Unemployment', *Australian Economic Papers* **28**(52), 39-56.

Morphy, F. and Sanders, W. G. (eds), (2001), *The Indigenous Welfare Economy and the CDEP Scheme*, CAEPR Monograph No. 20, CAEPR, ANU, Canberra.

Nisbett, R.E. (1998), 'Race, Genetics and IQ', in Phillips, M. and Jencks, C. (eds), *The Black-White Test Score Gap*, The Brookings Institute, Washington D.C.

Northern Territory Government (2004), *Market Basket Survey of Remote Community Stores in the Northern Territory: April-June 2004*, Northern Territory Government, Casuarina.

Overman, H.G. and Heath, A. (2000), *The Influence of Neighbourhood Effects on Education Decisions in a Nationally Funded Education System*, Centre for Economic Performance Working Paper, LSE, London.

Pearson, N. (2005), *Welfare reform and economic development for indigenous communities*, Centre for Independent Studies, St. Leonards.

Pearson, N. (2007), 'Stuck on the welfare pedestal', *The Australian: Opinion*, 10 February 2007.

Phillips, M., Brooks-Gunn, J., Duncan, G.J., Klebanov, P. and Crane, J. (1998), 'Family Background, Parenting Practices, and the Black-White Test Score Gap', in Jencks, C. and Phillips, M. (eds), *The Black-White Test Score Gap*, Brookings Institute Press, Washington D.C.

Press, F. and Hayes, A. (2000), *OECD thematic review of early childhood education and care policy: Australian background report*, Commonwealth Department of Education, Training and Youth Affairs, Canberra.

Preston, B. (2003) *The social make-up of schools: Family income, religion, Indigenous status, and family type in government, Catholic and nongovernment schools* Australian Education Union Information Paper http://www.aeufederal.org.au/Debates/bprestonsch.pdf

Purdie, N., Tripcony, P., Boulton-Lewis, G., Fanshawe, J. and Gunstone, A. (2000), *Positive Self–Identity for Indigenous Students and its Relationship to School Outcomes*, Report prepared for the Analysis and Equity Branch, Department of Education, Training and Youth Affairs, Canberra.

Raban, B. (2000), *Just the Beginning…*, Report prepared for Research and Evaluation Branch, Department of Education, Training and Youth Affairs, Canberra.

Ring, I.T. and Firman, D. (1998), 'Reducing indigenous mortality in Australia: lessons from other countries', *The Medical Journal of Australia* **169**, 528-533.

Ross, C.E. and Mirowsky, J. (1999), 'Refining the association between education and health: The effects of quantity credential and selectivity', *Demography* **36**(4), 445-460.

Ross, R. (1993), 'A Probit Analysis of Aboriginal Employment Prospects in New South Wales', *Economic Record* **69**(206), 253-258.

Ross, R. (2006), 'Recent Evidence on Health and Employment Status for Indigenous Australia', *Australian Journal of Labour Economics* **9**(1), 65-81

Rossiter, P.D. and Duncan, C.J. (2006), *Deriving Measures of Engagement in Secondary Education from the National Schools Statistics Collection*, ABS cat. no. 1351.0.55.016, ABS, Canberra.

Rothman, S. (2001), 'School absence and student background factors: A multilevel analysis', *International Education Journal* **2**(1), 59-68.

Rouse, C.E. (2004), 'Low-income students and college attendance: An exploration of income expectations', *Social Science Quarterly* **85**(5), 1299-1317.

Ryan, C. (2002), *Individual returns to vocational education and training qualifications: Their implications for lifelong learning*, NCVER, Adelaide.

Ryan, C. (2003), *A "Causal" Estimate of the effect of schooling on full-time employment among young Australians* ACER, Melbourne

Ryan, C. and Watson, L. (2004), *The Drift to Private Schools in Australia: Understanding its Features*, CEPR Discussion Paper No. 479, CEPR, ANU, Canberra.

Saito, M. (2003), 'Amartya Sen's Capability Approach to Education: A Critical Exploration', *Journal of Philosophy of Education* **37**(1), 17-33.

Sanbonmatsu, L., Kling, J.R., Duncan, G.J. and Brooks-Gunn, J. (2006), *Neighborhoods and Academic Achievement: Results from the Moving to Opportunity Experiment*, National Bureau of Economic Research Working Paper 11909, NBER, Cambridge.

Sanders, W. (1997), *Opportunities and problems astride the welfare/work divide: the CDEP scheme in Australian social policy*, CAEPR Discussion Paper No. 141, CAEPR, ANU, Canberra.

Sanders, W. and Morphy, F. (eds) (2001), *The Indigenous Welfare Economy and the CDEP Scheme* CAEPR Research Monograph No. 20, CAEPR, ANU, Canberra.

Saunders, P., Chalmers, J., McHugh, M. and Murray, C. (1998), *Development of Indicative Budget Standards for Australia*, Report for the Department of Social Security, Budget Standards Unit, SPRC, UNSW, Sydney.

Schwab, R.G. (1999), *Why Only One in Three? The Complex Reasons for Low Indigenous School Retention*, CAEPR Research Monograph 16, CAERP, ANU, Canberra.

Schwab, R.G. and Sutherland, D. (2003), 'Indigenous learning communities: a vehicle for community empowerment and capacity development', *Learning Communities: International Journal of Learning in Social Contexts* **1**(1), 53-70.

Sen, A.K. (1985), 'Well-being, Agency and Freedom: The Dewey Lectures 1984', *The Journal of Philosophy* **82**(4), 169-221.

Sen, A.K. (1999), *Development as Freedom*, Oxford University Press, Oxford.

Sewell, W.H. and Armer, J.M. (1966), 'Neighborhood Context and College Plans', *American Sociological Review* **31**(2), 159-168.

Sharplin, E. (2002), 'Rural retreat or outback hell: Expectations of rural and remote teaching', *Issues In Educational Research* **12**(1), 49-63.

Sicherman, N. (1991), ''Overeducation' in the Labor Market', *Journal of Labor Economics* **9**(2), 101-122.

Silburn, S.R., Zubrick, S.R., De Maio, J.A., Shepherd, C., Griffin, J.A., Mitrou, F.G., Dalby, R.B., Hayward, C. and Pearson, G. (2006), *The Western Australian Aboriginal Child Health Survey: Strengthening the Capacity of Aboriginal Children, Families and Communities*, Curtin University of Technology and Telethon Institute for Child Health Research, Perth.

Sjaastad, L. (1962), 'The costs and returns of human migration', *Journal of Political Economy* **70**(5, Part 2: Investment in Human Beings), 80-93.

Smith, E. and Wilson, L. (2002), 'The new child labour? The part-time student workforce in Australia', *Australian Bulletin of Labour* **28**(2), 120-137.

Smith, H.L. and Powell, B. (1990), 'Great expectations: Variations in income expectations among college seniors', *Sociology of Education* **63**(3), 194-207.

Spence, M. (1973), 'Job Market Signaling', *The Quarterly Journal or Economics* **87**(3), 355-374.

Streufert, P. (2000), 'The effect of underclass isolation on schooling choice', *Journal of Public Economic Theory* **2**(4), 461-482.

Taylor, J.T. (2006), *Population and diversity: Policy Implications of Emerging Demographic Trends*, CAEPR Discussion Paper No. 283, CAEPR, ANU, Canberra.

Taylor, J.T. and Biddle, N. (2005), *An evidence based analysis of Indigenous population and diversity*, Paper prepared for the Reconciliation Australia Planning Workshop, Canberra, May 2005.

Teasdale, G.R. and Whitelaw, A.J. (1981), *The early childhood education of Aboriginal children* Australian Council for Educational Research, Melbourne

Thurow, L.C. (1976), *Generating Inequality*, Basic, New York.

Tobias, J.L. (2003), 'Are Returns to Schooling Concentrated Among the Most Able? A Semiparametric Analysis of the Ability–earnings Relationships', *Oxford Bulletin of Economic and Statistics* **65**(1), 1-29.

Todaro, M.P. (1969), 'A model of labour migration and urban unemployment in less developed countries', *American Economic Review* **59**(1), 138-148.

Treadgold, M. L. (1988), 'Intercensal change in Aboriginal incomes, 1976-1986', *Australian Bulletin of Labour* **14**(4), 592-609.

Turley, R.N.L. (2003), 'When do neighborhoods matter? The role of race and neighborhood peers', *Social Science Research* **32**, 61-79.

UNESCO (United Nations Educational, Scientific and Cultural Organization) (2003), *The Right to Education – Scope and Implementation*, (last viewed 17 February 2007) http://www.unesco.org.

Vartanian, T.P. and Gleason, P.M. (1999), 'Do neighborhood conditions affect high school dropout and college graduation rates?', *Journal of Socio-Economics* **28**, 21-41.

Vella, F. (1999), 'Do Catholic Schools Make a Difference? Evidence from Australia', *The Journal of Human Resources* **34**(1), 208-224

Weatherburn, D., Snowball, L. and Hunter, B. (2006), 'The economic and social factors underpinning contact with the justice system: Results from the 2002 NATSISS survey', *Crime and Justice Bulletin* **104**, 1-16.

Wilson, K., Wolfe, B. and Haveman, R. (2005), 'The role of expectations in adolescent schooling choices: Do youths respond to economic incentives?', *Economic Inquiry* **43**(3), 467-492.

Wolfe, B. and Haveman R. (2001), 'Accounting for the social and non-market benefits of education', in Helliwell, J. (ed), *The Contribution of Human and Social Capital to Sustained Economic Growth and Well-being*, University of British Columbia Press, Vancouver.

Zubrick, S.R., Silburn, S.R., De Maio, J.A., Shepherd, C., Griffin, J.A., Dalby, R.B., Mitrou, F.G., Lawrence, D.M., Hayward, C., Pearson, G., Milroy, H., Milroy, J. and Cox, A. (2006), *The Western Australian Aboriginal Child Health Survey: Improving the Educational Experiences of Aboriginal Children and Young People*, Curtin University of Technology and Telethon Institute for Child Health Research, Perth.

Appendix 4 The 2001 Census

This Appendix gives more detailed information on the use of the Census in this thesis. Section 4A.1 gives more detail on the main questions used from the 2001 Census and Section 4A.2 outlines how SLAs with small Indigenous populations were merged with other areas.

4A.1 Census questions

This section documents the questions from the 2001 Census that are used to construct the main variables analysed in this thesis. That is, Indigenous status, employment, income and education attainment and participation. The questions are those discussed on the standard household form. Information in this section comes from ABS (2001).

4A.1.1 Indigenous status

The question used in this thesis to identify whether or not a person is Indigenous is Question 17 on the standard form. The question asks "Is the person of Aboriginal or Torres Strait Islander origin?" with the following three options:

- No
- Yes, Aboriginal
- Yes, Torres Strait Islander

Respondents are told that "For persons of both Aboriginal and Torres Strait Islander origin, mark both 'Yes' boxes." The ABS then codes respondents into:

- Non-Indigenous
- Aboriginal
- Torres Strait Islander
- Both Aboriginal and Torres Strait Islander
- Not stated

4A.1.2 Employment

There are a number of questions in the Census used to identify a person's employment status. It begins in Question 32 by asking "Last week, did the person have a full-time or part-time job of any kind?". The possible options were:

- Yes, worked for payment or profit
- Yes, but absent on holidays, on paid leave, on strike or temporarily stood down
- Yes, unpaid work in a family business
- Yes, other unpaid work
- No, did not have a job

Those who ticked one of the first three responses are classed in this thesis as being **employed**. Those who ticked one of the last two responses were sent to question 42. This question asks "Did the person actively look for work at any time in the last four weeks?" Those that answered that they did are then asked "If the person had found a job, could the person have started work last week?" Those who were not employed who answered yes to both these questions were classified as **unemployed**, whereas those who either were not looking for work or were not able to start work were classified as being **not in the labour force**.

The employment questions asked in the Census are a reduced set of questions compared to those used in the monthly Labour Force Survey which the ABS uses to calculate unemployment rates. Obviously, with a reduced set of questions there is the potential that employment is not measured as accurately in the Census as in other collections.

Those who are employed are asked a number of other questions relating to their employment status (Questions 33 to 41). Three which are used in this thesis are the number of hours worked in the week preceding the Census (Question 40), 'In the main job held *last week*, what was the person's occupation?' (Question 34) and 'What are the main tasks that the person *himself/herself* usually performs in that occupation?' (Question 35). These last two variables are coded by the ABS to the four digit occupation category (with six digit occupation available upon request) based on the Australian Standard Classification of Occupations (ASCO). This thesis only uses the one digit classification with potential occupation categories as follows:

- Managers and administrators;
- Professionals;
- Associate professionals;
- Tradespersons and related workers;
- Advanced clerical and service workers;
- Intermediate clerical, sales and service workers;
- Intermediate production and transport workers;
- Elementary clerical, sales and service workers; and
- Labourers and related workers;

4A.1.3 Income

The income question on the 2001 Census asks 'What is the gross income (including pensions and allowances) that the person usually receives each week from all sources?' and is applicable only for those aged 15 years and over. A list of sources of income that people should include is given, as well as being asked not to deduct tax, superannuation and health insurance.

Rather than getting respondents to record their exact income, individuals are asked to record the income group that is applicable. Values are given for weekly income, as well as the yearly equivalent. When modelling income using the Census in this thesis, I set those with negative income to zero and allocate the mean income value from the 2000/01

Survey of Income and Housing Costs (SIHC) to the 14 positive income groups. I apply the same mean income for Indigenous and non-Indigenous Australians regardless of other characteristics as per the following table. It should be noted that the income groups in the 2001 Census questionnaire are also listed in reverse order.

Table 4A.1 Lower and upper income bounds from the 2001 Census and the mean valued applied from the 2000/01 SIHC

Weekly income		Equivalent yearly income		
Lower bound ($)	Upper bound ($)	Lower bound ($)	Upper bound ($)	Value from the SIHC ($)
1,500		78,000		2,335
1,000	1,499	52,000	77,999	1,177
800	999	41,600	51,999	894
700	799	36,400	41,599	752
600	699	31,200	36,399	647
500	599	26,000	31,199	548
400	499	20,800	25,599	449
300	399	15,600	20,799	346
200	299	10,400	15,599	243
160	199	8,320	10,399	179
120	159	6,240	8,319	146
80	119	4,160	6,239	100
40	79	2,080	4,159	62
1	39	1	2,079	14
Nil income				0
Negative income				0

4A.1.4 Education

This thesis uses information on three aspects of education: a person's current student status; a person's highest level of schooling completed; and the highest level of non-school qualifications.

The first question on education (Question 22) asks "Is the person attending a school or any other educational institution?" Those who answer yes (either part-time or full-time) are then asked "What type of educational institution is the person attending?" The possible options are:

- Pre-school
- Infants/Primary school
    - Government
    - Catholic
    - Other non-government
- Secondary school
    - Government
    - Catholic
    - Other non-government
- Tertiary institution
    - Technical or further educational institution (including TAFE Colleges)
    - University or other higher educational institution

- Other educational institution

The remainder of the education questions are asked only of those aged 15 years or over. Question 25 asks “What is the highest level of primary or secondary school the person has completed?” with the following response options:

- Still at school
- Did not go to school
- Year 8 or below
- Year 9 or equivalent
- Year 10 or equivalent
- Year 11 or equivalent
- Year 12 or equivalent

Regardless of the person’s level of high school education, respondents are asked (in Question 26) “Has the person completed a trade certificate or any other educational qualification?” For those that answer yes, there are three more questions that are used to identify what the level is of their highest qualification. These are:

- “What is the level of the highest qualification the person has completed?”
- “What is the main field of study for the person’s highest qualification completed?”
- “At which institution was the person’s highest qualification completed?”

The answers from these questions are then coded by the ABS into the following categories:

- Postgraduate Degree Level
    - Postgraduate Degree Level, n.f.d.
    - Doctoral Degree Level
    - Master Degree Level
- Graduate Diploma and Graduate Certificate Level
    - Graduate Diploma and Graduate Certificate Level, n.f.d.
    - Graduate Diploma Level
    - Graduate Certificate Level
- Bachelor Degree Level
    - Bachelor Degree Level
- Advanced Diploma and Diploma Level
    - Advanced Diploma and Diploma Level, n.f.d.
    - Advanced Diploma and Associate Degree Level
    - Diploma Level
- Certificate Level
    - Certificate Level, n.f.d.
    - Certificate III & IV Level
    - Certificate I & II Level

4A.2 Combining SLAs

As outlined in Chapter 4, to be able to obtain robust estimates of the predicted benefits of education by SLA, it is necessary to combine those SLAs which have a small Indigenous population. The following Table lists the original SLAs (on the left hand side of each column) with the SLAs that they were combined with (on the right hand side). There are four columns and the Table extends over three pages.

Table 4A.2 Merged SLAs – New South Wales and Victoria

Original	New	Original	New	Original	New	Original	New
10112	10111	16100	13300	21954	26430	25496	26730
10400	15100	16421	13200	21955	26430	25621	25622
10650	15500	16750	13300	22115	22111	25715	25713
10700	15100	16850	13000	22117	22111	25718	25713
10800	12900	17250	13150	22250	26614	25811	23191
10851	16150	17350	17751	22412	22411	25814	23191
10852	12350	17450	10050	22413	22411	25991	20260
11000	17050	17700	10050	22491	22492	25994	20260
11050	13150	17754	17751	22622	22622	26080	22757
11401	16150	17800	15500	22624	22622	26171	26174
11402	16150	17850	10111	22625	22622	26175	20744
11850	15500	18100	12900	22626	22622	26261	22411
11950	12604	18300	15500	22628	22622	26264	22411
12000	17751	18600	15100	22758	22492	26265	22411
12200	17751	18652	18651	22834	22831	26493	22757
12250	13200	18809	11250	22911	20260	26495	22757
12300	10050	20111	23351	22912	20260	26616	26614
12400	13150	20112	23351	22980	23191	26671	27170
12450	10050	20573	20572	23191	23191	26672	23351
12500	15500	20741	20744	23194	23191	26704	26701
12801	10450	20831	23811	23352	23351	26705	26701
12802	10450	20834	20835	23674	23671	26811	26814
13050	12700	21111	21112	23815	23814	26812	26814
13500	17751	21181	21182	23818	23814	26813	26814
13600	13150	21271	26614	23943	23945	26815	26814
13650	10111	21272	26614	24131	24135	26890	23191
13850	11600	21375	21371	24134	24135	27071	27261
13900	10050	21376	21374	24211	24214	27264	27261
14050	10050	21454	21452	24601	24608	27451	27454
14100	16700	21618	21613	24605	24608	27458	20835
14201	15100	21671	23945	24782	26614	27631	23191
14250	15500	21674	23945	24901	24904	27632	23191
14950	17751	21751	22492	25151	20260	28469	26730
15250	16800	21754	22492	25154	20260	28529	26174
15350	15950	21755	22492	25155	20260	28649	26174
15450	13150	21831	26730	25434	25431		
15600	16800	21832	26730	25491	26730		
16000	16304	21951	26430	25493	26730		

Table 4A.3 Merged SLAs – Queensland and South Australia

Original	New	Original	New	Original	New	Original	New
30150	34700	31416	31511	33850	34700	40314	44551
30450	34700	31424	31007	33974	33976	40315	44551
30500	33000	31427	31421	34000	33300	40430	41560
30650	30850	31438	31064	34050	34700	40521	40524
30700	33300	31443	31064	34100	33000	40704	40701
30750	34700	31456	31012	34201	36451	41140	41560
30900	37400	31463	31012	34300	33300	41190	43710
31004	31623	31465	31566	34400	33300	41750	43710
31018	31566	31467	31623	34603	34615	41830	46090
31023	31451	31473	31566	34605	34631	41960	43710
31026	31623	31476	31367	34642	34631	42110	41560
31048	31566	31484	31288	34645	34618	42250	44620
31053	31566	31487	31596	34651	34631	42750	48050
31057	31108	31492	31154	34663	34623	43080	47800
31067	31623	31495	31626	34800	32450	43220	43710
31075	31121	31498	31451	35000	34204	43360	44620
31083	31566	31506	31558	35050	36550	43570	43710
31086	31042	31528	31481	35150	33300	43650	44551
31091	36257	31541	31503	35250	31950	43791	40524
31094	31012	31582	31566	35550	34204	43794	40524
31102	31113	31585	31566	35700	36550	43920	44551
31105	36257	31601	31571	35752	35758	44344	44345
31124	31108	31612	31301	35756	35758	44554	44551
31127	31566	31615	31012	35850	33000	44830	46090
31132	31522	31618	31623	35900	33300	45090	44620
31143	31421	31645	31522	35951	35978	45120	46451
31146	31421	31750	35800	35963	35961	45342	45346
31162	31451	31850	30850	36050	34204	45400	46451
31167	31596	32104	30350	36264	36262	45540	46451
31173	31064	32136	32138	36265	36273	45684	45681
31187	31277	32151	36451	36267	36273	45686	45688
31214	31277	32154	33900	36271	36273	46454	46451
31217	31326	32350	34204	36300	32450	46671	46674
31222	31293	32400	33900	36454	34204	46860	44620
31228	31421	32554	34204	36600	33900	47148	47141
31233	31421	32600	34850	36650	34700	47290	47800
31241	31522	32700	32300	36700	34204	47490	41010
31244	31623	32750	37400	36750	34204	47630	44620
31252	31571	33100	34850	36850	33300	47704	47705
31255	31623	33471	33461	37003	37065	47910	43710
31258	31042	33494	33476	37031	37033	48130	41560
31271	31151	33497	33577	37047	37033	48260	46510
31274	31623	33507	33583	37068	37078	48341	44620
31296	31517	33512	33527	37084	36831	48344	44620
31306	31566	33513	33557	37100	34204	48750	48050
31315	31481	33517	33585	37150	34204	48834	48831
31318	31566	33521	33573	37200	30850	48899	45895
31323	31566	33523	33573	37263	33900	48969	48831
31331	31503	33541	33577	37265	33900	49039	40524
31337	31367	33545	33583	37266	33900	49109	47800
31356	31588	33547	33543	37500	33300	49179	43710
31375	31596	33555	33587	40124	40121	49249	41010
31378	31454	33563	33573	40125	44551	49389	48540
31386	31566	33575	33531	40128	44551	49459	46451
31394	36283	33593	33525	40224	40221		
31408	31301	33754	33300	40311	44551		

Table 4A.4 Merged SLAs – Western Australia, Tasmania, the Northern Territory and the Australian Capital Territory

Original	New	Original	New	Original	New	Original	New
50560	56650	56230	55110	71064	71138	83789	86219
50630	51890	56300	50840	71084	71138	83879	84149
50770	50840	56370	51120	71108	71044	83969	84149
50840	50840	56510	56440	71128	71138	84059	88739
50910	56440	56720	56650	71138	71138	84239	85319
51050	54340	56860	51120	72304	72308	84329	86219
51120	51120	56930	55740	72806	72804	84419	86849
51401	51190	57000	54060	80089	80639	84509	86129
51404	51190	57081	57082	80239	86249	84589	86219
51470	54060	57140	56440	80279	84149	85049	88559
51610	56790	57350	56650	80339	81549	85139	82139
51680	55600	57420	53290	80369	84959	85409	84779
51750	56580	57630	55250	80459	85949	85489	81359
51960	54281	57770	51540	80549	84149	85589	82139
52030	54060	58120	54340	80609	81549	85679	84149
52100	56440	58190	56650	80729	84779	85769	88559
52170	55740	58260	54060	80909	80639	85859	86849
52240	57210	58330	56650	81089	87389	86039	86719
52310	56440	58400	51120	81179	82139	86279	86249
52380	55250	58470	51540	81269	86849	86309	84959
52450	56650	58540	55600	81449	80639	86389	85229
52520	56650	58610	56440	81629	84149	86489	85319
52590	55600	58680	56440	81719	85319	86579	88379
52661	53991	58820	53994	81809	84959	86669	84149
52664	51890	58890	56440	81889	88559	86759	84959
53431	53432	59030	51120	81989	88559	86939	85319
53570	55600	59100	56440	82079	88739	87029	84959
53640	54340	59170	56440	82169	80639	87119	86219
53710	56650	59250	55250	82259	85949	87209	80639
54130	54340	59310	56650	82349	81359	87479	80639
54284	54281	59380	54340	82439	86849	87569	84149
54410	51120	59450	56650	82529	87389	87659	85949
54480	54340	59590	55250	82619	85949	87749	87389
54550	54340	59660	51120	82709	82139	87839	87389
54620	56440	59730	56650	82789	86219	87929	86219
54690	56650	60612	65412	82889	82139	88109	86849
54760	56440	60812	63210	82979	84959	88189	81549
54900	56440	63812	63210	83069	85319	88289	80639
55180	50840	64011	64012	83159	81359	88469	87389
55390	54281	64013	64012	83249	84779	88649	84149
55460	51120	64611	64211	83289	81549	88829	88739
55530	54060	64612	64211	83339	81359	88919	84959
55670	54060	64812	62410	83379	88379	89009	81549
55810	55250	65210	62410	83429	84959	88109	86849
55880	51120	65812	65811	83529	86719	88189	81549
55950	51120	70203	70205	83609	88559	88289	80639
56160	55250	71052	71048	83689	86249		

Appendix 5 Calculating the predicted benefits of education

The first part of this appendix outlines how the costs of education, taxes and life expectancy are taken into account when calculating the predicted benefits of education for Chapter 6. The next part (Section 5A.2) then gives the predicted level of employment and income that the benefits of education are based on. Section 5A.3 gives the coefficient estimates used to generate these predictions. In the final two sections, variation in lifetime employment and income by population subgroup are given, as well as the co-efficient estimates and p-values using the 2002 NATSISS that these estimates are based on.

5A.1 Taking into account the costs of education and taxes

If a person decided not to be a student, then because of the extra time available, there is quite a good chance that they would be able to obtain a higher income than they can whilst studying. A major cost of education is, therefore, income foregone whilst studying. This opportunity cost for full-time students is captured by the differences in the estimate of income between the student and non-student population.

In addition to the opportunity costs there are; however, additional costs involved with undertaking an education, mainly for fees and equipment. For those undertaking secondary study, these more direct costs are assumed to be zero. In the five category breakdown, however, non-school qualifications are expected to involve some direct costs. For university students, the first part of this direct cost is made up of things like text-books, student union fees and other miscellaneous items. This is estimated to be $770 per year, based on Johnson, Beer and Lloyd (2002) and is assumed to be paid in the year in which the education occurs.

The second part of the direct cost of education for university students is the individual's contribution to the Higher Education Contribution Scheme (HECS)[89]. The estimation of this cost is difficult because individuals do not usually pay this fee up front, but instead pay it back once their income reaches a certain level. This liability is paid back by a certain amount per year, at a rate determined by the income received during that year. The HECS liability to be paid from the start of the subsequent year is calculated as the liability at the start of the current year, minus the amount paid. A HECS liability in the first year after graduating is assumed to be $20 500 based on a four year science degree in 2001 (from Johnson, Beer and Lloyd 2002). I use the 2001 repayment rates (available from the ATO website).

For other non-school students, the direct costs are lower, however they are more likely to be paid upfront. Fees for these courses are set at the state rather than national level. Even within states, fee structures are quite heterogeneous and vary by the type of course and the institution or provider (Ryan 2002). Taking the midpoint of Ryan's (2002) estimate of

[89] HECS is a form of student loans where the majority of a the cost of education is paid for by the government and the rest is paid back through the tax system once the student reaches a certain level of income

course costs being between $500 and $1000 and adding the $200 for material and resource costs, an estimated cost of $950 is applied.

The income measure available in the Census is gross personal income. However, to better reflect the economic resources available to an individual, an estimate is made of after tax income. To do this, the marginal tax rates applicable for 2001/02 (available from the ATO website) are used.

As this thesis focuses on personal income rather than earnings, an income value is estimated over the whole life-cycle, not just a person's working life. People do not live forever though, and it is therefore important to estimate the time at which a person is going to die. Females live on average longer than males and the life expectancy of Indigenous Australians is much lower than for the non-Indigenous. As such different life expectancies are used for each of the four demographic groups.

Age at death is also estimated separately for each education level. There is evidence within Australia that higher education levels lead to better health for both Indigenous and non-Indigenous Australians (as shown later in Chapter 5). However, to the author's knowledge no estimate has been made for differences in life expectancy. Instead, this thesis uses an estimated differential based on US data and applies this to Australia. To do this, results from Crimmins and Saito (2001) are used in the following way:

- Year 12 only: Use Australian life expectancy for males (77 years for non-Indigenous and 56 years for Indigenous) and females (82 years for non-Indigenous and 63 years for Indigenous).
- Year 12 and qualification: Multiply the Year 12 figure (above) by the ratio of the 13+ years of education completed to the 9-12 years completed estimations from Crimmins and Saito (2001).
- Did not finish year 12: Multiply the Year 12 figure (above) by the ratio of the 0-8 years completed to 9-12 years completed from Crimmins and Saito (2001).

5A.2 Lifetime employment and income by education completion – 2001 Census

Table 5A.1 Lifetime average probability of employment by education completion

	Indigenous		Non-Indigenous	
Type of Education	Male	Female	Male	Female
Did not complete Year 12	0.531	0.387	0.782	0.592
Completed Year 12	0.723	0.628	0.856	0.755
No Year 12 and no qualifications	0.511	0.366	0.747	0.575
No Year 12 and has a qualification	0.763	0.636	0.893	0.708
Year 12 and no qualifications	0.691	0.556	0.855	0.690
Year 12 and non-degree qualification	0.824	0.711	0.909	0.771
Year 12 and degree	0.866	0.804	0.939	0.833

Source: Customised estimations from the 2001 Census. The coefficient estimates for these tables are given in Appendix Table 5A.8 to 5A..11.

Table 5A.2 Lifetime average probability of full-time employment by education completion

Type of Education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Did not complete Year 12	0.315	0.161	0.627	0.281
Completed Year 12	0.519	0.362	0.688	0.426
No Year 12 and no qualifications	0.290	0.142	0.591	0.267
No Year 12 and has a qualification	0.605	0.343	0.763	0.333
Year 12 and no qualifications	0.485	0.310	0.702	0.386
Year 12 and non-degree qualification	0.666	0.422	0.779	0.424
Year 12 and degree	0.715	0.531	0.821	0.505

Source: Customised estimations from the 2001 Census. The coefficient estimates for these tables are given in Appendix Table 5A.12 to 5A.15.

Table 5A.3 Lifetime average probability of employment in a high-status occupation by education completion

Type of Education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Did not complete Year 12	0.169	0.240	0.240	0.233
Completed Year 12	0.406	0.466	0.557	0.527
No Year 12 and no qualifications	0.138	0.189	0.221	0.193
No Year 12 and has a qualification	0.235	0.447	0.256	0.334
Year 12 and no qualifications	0.301	0.309	0.424	0.305
Year 12 and non-degree qualification	0.397	0.550	0.471	0.516
Year 12 and degree	0.822	0.850	0.853	0.792

Source: Customised estimations from the 2001 Census. The coefficient estimates for these tables are given in Appendix Table 5A.16 to 5A.20.

Table 5A.4 Lifetime income by education completion

Type of Education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Did not complete Year 12	626,303	663,433	1,391,465	1,000,054
Completed Year 12	1,027,185	975,180	2,099,152	1,472,833
No Year 12 and no qualifications	574,989	629,635	1,261,676	960,662
No Year 12 and has a qualification	925,432	875,543	1,583,658	1,148,917
Year 12 and no qualifications	881,455	815,656	1,708,061	1,209,367
Year 12 and non-degree qualification	1,172,341	1,042,220	1,948,708	1,431,365
Year 12 and degree	1,560,971	1,269,474	2,845,214	1,776,243

Source: Customised estimations from the 2001 Census. The coefficient estimates for these tables are given in Appendix Table 5A.22 to 5A.25.

Table 5A.5 Lifetime income for those employed by education completion

Type of Education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Did not complete Year 12	1,192,874	1,013,133	1,594,576	1,138,264
Completed Year 12	1,759,412	1,413,105	2,242,842	1,586,448
No Year 12 and no qualifications	780,085	778,425	1,429,172	1,141,217
No Year 12 and has a qualification	1,075,373	1,045,244	1,658,360	1,296,487
Year 12 and no qualifications	1,065,658	996,340	1,822,061	1,380,836
Year 12 and non-degree qualification	1,291,598	1,198,831	2,018,204	1,568,831
Year 12 and degree	1,676,926	1,421,899	2,901,995	1,908,206

Source: Customised estimations from the 2001 Census. The coefficient estimates for these tables are given in Appendix Table 5A.22 to 5A.25.

Table 5A.6 Lifetime income for those employed full-time by education completion

Type of Education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Did not complete Year 12	1,351,663	1,205,151	1,651,486	1,315,568
Completed Year 12	1,869,635	1,569,472	2,318,208	1,793,676
No Year 12 and no qualifications	1,240,391	1,109,213	1,490,154	1,225,171
No Year 12 and has a qualification	1,568,833	1,372,508	1,694,498	1,374,578
Year 12 and no qualifications	1,569,285	1,315,313	1,884,973	1,456,488
Year 12 and non-degree qualification	1,826,231	1,636,919	2,059,993	1,681,180
Year 12 and degree	2,399,744	1,815,879	2,949,945	2,020,081

Source: Customised estimations from the 2001 Census. The coefficient estimates for these tables are given in Appendix Table 5A.22 to 5A.25.

Table 5A.7 Lifetime income for those employed by education completion – Variation by age of completion

Type of Education	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Part-time students				
No Year 12 and no qualifications	780,085	778,425	1,429,172	1,141,217
No Year 12 and has a qualification	856,237	903,937	1,563,954	1,261,596
Year 12 and no qualifications	1,065,658	996,340	1,822,061	1,380,836
Year 12 and non-degree qualification	1,181,255	1,140,647	1,988,391	1,557,076
Year 12 and degree	1,361,922	1,224,194	2,607,086	1,779,966
Those who commence their studies late				
No Year 12 and no qualifications	780,085	778,425	1,429,172	1,141,217
No Year 12 and has a qualification	1,015,544	1,005,460	1,595,743	1,279,985
Year 12 and no qualifications	1,065,658	996,340	1,822,061	1,380,836
Year 12 and non-degree qualification	1,247,367	1,174,533	1,993,215	1,552,260
Year 12 and degree	1,583,672	1,378,889	2,786,510	1,897,611

Source: Customised estimations from the 2001 Census. The coefficient estimates for these tables are given in Appendix Table 5A.22 to 5A.25.

5A.3 Coefficient estimates – 2001 Census

Table 5A.8 Coefficient estimates for the probability of being employed – Two category education specification for those aged under 55

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Intercept	-1.33018	-1.45993	-1.28977	-0.74664
Age	0.07626	0.05248	0.11536	0.04462
Age squared	-0.00095	-0.00051	-0.00147	-0.00044
Year 12	0.12975	1.28987	-0.81551	1.19553
Age * Year 12	0.03551	-0.02679	0.06217	-0.03444
Age squared * Year 12	-0.00063	0.00021	-0.00079	0.00035

Source: Customised estimations from the 2001 Census.

Table 5A.9 Coefficient estimates for the probability of being employed – Two category education specification for those aged 55 years and over

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Intercept	13.00080	-1.45993	15.13611	15.94355
Age	-0.34858	0.05248	-0.37274	-0.42056
Age squared	0.00206	-0.00051	0.00201	0.00242
Year 12	0.00843	1.28987	-0.92077	0.82664
Age * Year 12	-0.01998	-0.02679	0.03309	-0.01277
Age squared * Year 12	0.00043	0.00021	-0.00022	0.00009

Source: Customised estimations from the 2001 Census.

Table 5A.10 Coefficient estimates for the probability of being employed – Five category education specification for those aged under 55

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Intercept	-1.00824	-0.70982	-0.66754	-1.30634
Age	0.05382	0.03925	0.07236	0.04038
Age squared	-0.00066	-0.00039	-0.00092	-0.00037
Degree	1.65489	3.83461	0.53401	3.32010
Year 12 and qualification	0.79559	3.00120	0.58216	2.10660
Year 12 no qualification	0.50215	2.50223	0.30067	1.89662
No Year 12 and qualification	0.75567	1.30345	0.53828	1.19607
Years since completed degree	-0.00144	-0.01642	0.00400	-0.01315
Years since completed a qualification	0.00622	-0.00756	0.00339	-0.00469
Age * Degree	-0.01482	-0.15142	0.02401	-0.08736
Age * Year 12 and qualification	0.02590	-0.12281	0.01644	-0.05229
Age * Year 12 no qualification	0.02139	-0.10675	0.01641	-0.06319
Age * No Year 12 and qualification	-0.00083	-0.04764	0.01075	-0.03307
Age squared * Degree	0.00001	0.00195	-0.00041	0.00094
Age squared * Year 12 and qualification	-0.00064	0.00154	-0.00039	0.00057
Age squared * Year 12 no qualification	-0.00054	0.00121	-0.00034	0.00065
Age squared * No Year 12 and qualification	-0.00011	0.00067	-0.00029	0.00056

Source: Customised estimations from the 2001 Census.

Table 5A.11 Coefficient estimates for the probability of being employed – Five category education specification for those aged 55 years and over

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Intercept	12.65775	15.40709	13.97420	15.49334
Age	-0.33916	-0.40915	-0.34596	-0.44781
Age squared	0.00198	0.00235	0.00186	0.00287
Degree	8.78333	1.89849	-0.39114	-10.02489
Year 12 and qualification	7.87301	1.03521	1.91713	8.33128
Year 12 no qualification	-7.53626	0.85688	-0.66909	-7.82904
No Year 12 and qualification	7.99317	1.26088	2.63071	-2.25638
Years since completed degree	-0.01167	-0.01182	-0.00255	-0.01848
Years since completed a qualification	-0.00278	-0.00750	-0.00296	-0.00770
Age * Degree	-0.26590	-0.02645	0.03039	0.34691
Age * Year 12 and qualification	-0.27016	-0.01071	-0.03950	-0.21610
Age * Year 12 no qualification	0.20236	-0.02102	0.02650	0.24920
Age * No Year 12 and qualification	-0.23563	-0.01515	-0.05377	0.09494
Age squared * Degree	0.00228	0.00020	-0.00021	-0.00258
Age squared * Year 12 and qualification	0.00240	0.00010	0.00024	0.00159
Age squared * Year 12 no qualification	-0.00121	0.00018	-0.00020	-0.00186
Age squared * No Year 12 and qualification	0.00184	0.00008	0.00026	-0.00067

Source: Customised estimations from the 2001 Census.

Table 5A.12 Coefficient estimates for the probability of being employed full-time – Two category education specification for those aged under 55

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Intercept	-2.16796	-0.67623	-1.68027	-2.10834
Age	0.08546	-0.00164	0.10926	0.04671
Age squared	-0.00099	0.00011	-0.00137	-0.00041
Year 12	0.05813	-0.24283	-1.85573	0.83292
Age * Year 12	0.03820	0.04364	0.11046	0.00315
Age squared * Year 12	-0.00064	-0.00066	-0.00137	-0.00021

Source: Customised estimations from the 2001 Census.

Table 5A.13 Coefficient estimates for the probability of being employed full-time – Two category education specification for those aged 55 years and over

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Intercept	12.63506	10.22035	12.83680	11.63794
Age	-0.35562	-0.30362	-0.31382	-0.31774
Age squared	0.00216	0.00182	0.00156	0.00172
Year 12	-0.82366	5.10519	0.48898	3.04392
Age * Year 12	0.01125	-0.14163	-0.01094	-0.08237
Age squared * Year 12	0.00015	0.00110	0.00010	0.00062

Source: Customised estimations from the 2001 Census.

Table 5A.14 Coefficient estimates for the probability of being employed full-time – Five category education specification for those aged under 55

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Intercept	-1.86162	-1.95248	-1.15000	-0.55771
Age	0.06108	0.03243	0.07231	-0.01033
Age squared	-0.00066	-0.00023	-0.00089	0.00021
Degree	1.09740	2.95984	0.53329	4.00180
Year 12 and qualification	1.11697	1.96688	0.49884	2.79103
Year 12 no qualification	0.46874	1.63940	-0.36460	1.53764
No Year 12 and qualification	1.02161	1.78830	0.79391	1.64249
Years since completed degree	0.00615	-0.01309	0.00578	-0.01759
Years since completed a qualification	0.01149	-0.00298	0.00602	-0.00856
Age * Degree	0.01535	-0.07160	0.01207	-0.16173
Age * Year 12 and qualification	0.01131	-0.03927	0.00952	-0.11168
Age * Year 12 no qualification	0.02211	-0.04099	0.04379	-0.05297
Age * No Year 12 and qualification	-0.00777	-0.05880	-0.01043	-0.06831
Age squared * Degree	-0.00043	0.00074	-0.00026	0.00201
Age squared * Year 12 and qualification	-0.00051	0.00030	-0.00028	0.00133
Age squared * Year 12 no qualification	-0.00051	0.00033	-0.00065	0.00052
Age squared * No Year 12 and qualification	-0.00010	0.00077	-0.00003	0.00087

Source: Customised estimations from the 2001 Census.

Table 5A.15 Coefficient estimates for the probability of being employed full-time – Five category education specification for those aged 55 years and over

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Intercept	12.25986	11.16064	11.94406	11.43669
Age	-0.34672	-0.34007	-0.29449	-0.31519
Age squared	0.00209	0.00213	0.00146	0.00172
Degree	4.62731	-8.38725	2.03533	4.08224
Year 12 and qualification	6.51988	2.05347	1.91122	2.37179
Year 12 no qualification	-8.90334	11.48321	0.38656	2.01859
No Year 12 and qualification	6.87181	-5.03293	1.56053	-1.03919
Years since completed degree	-0.00918	-0.02614	-0.00233	-0.01372
Years since completed a qualification	0.00054	-0.00480	-0.00231	-0.00819
Age * Degree	-0.12163	0.28811	-0.04632	-0.10337
Age * Year 12 and qualification	-0.23067	-0.01456	-0.04201	-0.05819
Age * Year 12 no qualification	0.25006	-0.33031	-0.00705	-0.05546
Age * No Year 12 and qualification	-0.19852	0.18196	-0.02368	0.04547
Age squared * Degree	0.00106	-0.00207	0.00033	0.00085
Age squared * Year 12 and qualification	0.00210	-0.00002	0.00026	0.00049
Age squared * Year 12 no qualification	-0.00162	0.00244	0.00005	0.00043
Age squared * No Year 12 and qualification	0.00152	-0.00134	0.00003	-0.00033

Source: Customised estimations from the 2001 Census.

Table 5A.16 Coefficient estimates for the probability of being employed as a manager, professional or semi-professional – Two category education specification for those aged under 55

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Intercept	-2.29473	-2.22103	-2.37959	-1.93283
Age	0.05822	0.06878	0.07222	0.05460
Age squared	-0.00055	-0.00069	-0.00067	-0.00055
Year 12	-0.86965	-0.87218	-1.25525	-1.68014
Age * Year 12	0.07698	0.07651	0.11639	0.13750
Age squared * Year 12	-0.00084	-0.00089	-0.00146	-0.00175

Source: Customised estimations from the 2001 Census.

Table 5A.17 Coefficient estimates for the probability of being employed as a manager, professional or semi-professional – Two category education specification for those aged 55 years and over

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Intercept	2.76469	-3.62562	-0.00462	-6.99669
Age	-0.10712	0.11313	-0.02361	0.20946
Age squared	0.00081	-0.00100	0.00030	-0.00166
Year 12	8.09862	19.00542	0.87892	4.77623
Age * Year 12	-0.17224	-0.56479	0.01209	-0.11840
Age squared * Year 12	0.00085	0.00428	-0.00023	0.00083

Source: Customised estimations from the 2001 Census.

Table 5A.18 Coefficient estimates for the probability of being employed as a manager, professional or semi-professional – Five category education specification for those aged under 55

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Intercept	-2.06846	-2.13489	-2.28101	-1.84207
Age	0.03776	0.05772	0.06080	0.04454
Age squared	-0.00030	-0.00062	-0.00053	-0.00047
Degree	1.31890	1.67273	1.65761	0.96553
Year 12 and qualification	-0.64722	-0.91349	-0.18389	-1.05199
Year 12 no qualification	-0.61020	-0.12765	-0.82186	-0.51938
No Year 12 and qualification	-0.50585	-0.07671	-0.14760	-0.20164
Years since completed degree	-0.00229	0.01151	-0.00323	-0.02128
Years since completed a qualification	-0.00479	0.00715	-0.00550	0.00202
Age * Degree	0.04734	0.00762	0.01897	0.04567
Age * Year 12 and qualification	0.07061	0.08577	0.04554	0.08876
Age * Year 12 no qualification	0.05882	0.02422	0.08004	0.05073
Age * No Year 12 and qualification	0.04667	0.02273	0.01711	0.02298
Age squared * Degree	-0.00068	-0.00014	-0.00031	-0.00043
Age squared * Year 12 and qualification	-0.00073	-0.00096	-0.00048	-0.00095
Age squared * Year 12 no qualification	-0.00069	-0.00027	-0.00106	-0.00069
Age squared * No Year 12 and qualification	-0.00052	-0.00013	-0.00017	-0.00019

Source: Customised estimations from the 2001 Census.

Table 5A.19 Coefficient estimates for the probability of being employed as a manager, professional or semi-professional – Five category education specification for those aged 55 years and over

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Intercept	0.75753	-3.61249	-0.90986	-7.75984
Age	-0.05171	0.09885	-0.00385	0.22319
Age squared	0.00041	-0.00085	0.00021	-0.00173
Degree	14.81765	38.46864	4.04661	10.37717
Year 12 and qualification	8.90159	-15.28143	1.99186	3.86505
Year 12 no qualification	15.92536	22.87299	1.04705	2.90587
No Year 12 and qualification	3.15200	27.28081	1.04628	1.99756
Years since completed degree	-0.00275	-0.01059	0.00209	-0.01076
Years since completed a qualification	0.00196	-0.00167	-0.00057	0.00072
Age * Degree	-0.38049	-1.16880	-0.05053	-0.25411
Age * Year 12 and qualification	-0.21534	0.50796	-0.02094	-0.08262
Age * Year 12 no qualification	-0.40906	-0.68428	-0.00510	-0.08102
Age * No Year 12 and qualification	-0.08056	-0.87772	-0.01366	-0.04525
Age squared * Degree	0.00269	0.00927	0.00013	0.00183
Age squared * Year 12 and qualification	0.00132	-0.00387	-0.00003	0.00054
Age squared * Year 12 no qualification	0.00254	0.00511	-0.00011	0.00060
Age squared * No Year 12 and qualification	0.00058	0.00731	-0.00004	0.00032

Source: Customised estimations from the 2001 Census.

Table 5A.20 Coefficient estimates for gross personal income – Two category education specification for those aged under 55 by employment status

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Not employed				
Intercept	-119.592	-161.931	-163.013	6.776
Age	17.787	26.152	19.985	12.216
Age squared	-0.222	-0.379	-0.233	-0.178
Year 12	-23.687	-107.619	-184.978	-37.525
Age * Year 12	2.327	5.904	10.638	-1.861
Age squared * Year 12	-0.015	-0.075	-0.109	0.074
Employed				
Intercept	-294.397	-129.436	-442.415	-7.762
Age	40.243	27.597	57.636	24.114
Age squared	-0.448	-0.311	-0.655	-0.273
Year 12	-398.935	-345.875	-1089.565	-731.279
Age * Year 12	29.153	27.555	67.100	50.194
Age squared * Year 12	-0.300	-0.321	-0.750	-0.618
Not employed				
Intercept	-281.796	-141.458	-383.947	-120.959
Age	46.309	35.250	56.265	37.351
Age squared	-0.535	-0.405	-0.635	-0.441
Year 12	-387.832	-302.187	-890.603	-712.912
Age * Year 12	24.777	23.250	57.631	50.156
Age squared * Year 12	-0.214	-0.253	-0.632	-0.610

Source: Customised estimations from the 2001 Census.

Table 5A.21 Coefficient estimates for gross personal income – Two category education specification for those aged 55 years and over by employment status

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Not employed				
Intercept	206.856	-234.995	701.998	-580.981
Age	0.709	12.564	-13.821	20.928
Age squared	-0.008	-0.086	0.110	-0.129
Year 12	-132.880	970.409	104.129	82.432
Age * Year 12	6.150	-26.530	-0.350	-0.930
Age squared * Year 12	-0.044	0.185	0.011	0.012
Employed				
Intercept	3540.315	501.996	3405.051	1235.762
Age	-86.109	1.709	-73.299	-20.706
Age squared	0.598	-0.045	0.470	0.137
Year 12	4417.560	1540.535	1491.296	2002.150
Age * Year 12	-122.367	-36.809	-32.339	-51.622
Age squared * Year 12	0.893	0.242	0.223	0.359
Not employed				
Intercept	3165.251	-860.755	2655.400	845.866
Age	-72.674	49.651	-49.902	-2.195
Age squared	0.509	-0.425	0.306	-0.027
Year 12	2393.059	-1233.558	1308.353	1740.931
Age * Year 12	-54.035	39.489	-26.293	-44.398
Age squared * Year 12	0.320	-0.263	0.183	0.322

Source: Customised estimations from the 2001 Census.

Table 5A.22 Coefficient estimates for gross personal income – Five category education specification for those aged under 55 for those not employed and employed

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Not employed				
Intercept	-120.570	-146.937	-134.046	53.239
Age	17.721	25.406	17.822	10.161
Age squared	-0.224	-0.371	-0.207	-0.158
Degree	324.788	129.630	-247.346	141.214
Year 12 and qualification	309.946	-119.623	15.640	90.570
Year 12 no qualification	-0.729	-70.702	-80.928	7.777
No Year 12 and qualification	206.927	141.484	162.261	70.972
Years since completed degree	10.723	-1.977	6.258	-0.242
Years since completed a qualification	1.254	-1.169	0.584	-0.708
Age * Degree	-15.676	-8.646	20.622	-12.654
Age * Year 12 and qualification	-15.704	6.231	3.042	-9.615
Age * Year 12 no qualification	1.204	4.130	4.847	-3.918
Age * No Year 12 and qualification	-10.775	-8.333	-4.548	-5.839
Age squared * Degree	0.173	0.154	-0.277	0.248
Age squared * Year 12 and qualification	0.227	-0.069	-0.041	0.187
Age squared * Year 12 no qualification	-0.005	-0.055	-0.049	0.085
Age squared * No Year 12 and qualification	0.151	0.121	0.040	0.103
Employed				
Intercept	-197.436	-104.042	-357.049	26.133
Age	32.129	25.144	49.776	22.053
Age squared	-0.344	-0.290	-0.556	-0.257
Degree	-108.139	215.566	-1096.723	-151.708
Year 12 and qualification	-247.901	-114.634	-292.988	-47.884
Year 12 no qualification	-331.825	-262.429	-540.716	-292.822
No Year 12 and qualification	56.499	186.067	148.519	141.405
Years since completed degree	11.811	2.990	9.019	-2.856
Years since completed a qualification	3.952	2.328	0.116	0.353
Age * Degree	27.706	8.119	84.074	28.073
Age * Year 12 and qualification	27.496	17.040	24.974	9.458
Age * Year 12 no qualification	27.372	24.388	36.254	23.183
Age * No Year 12 and qualification	9.275	-4.049	-0.077	-5.311
Age squared * Degree	-0.331	-0.075	-1.030	-0.306
Age squared * Year 12 and qualification	-0.355	-0.221	-0.263	-0.095
Age squared * Year 12 no qualification	-0.340	-0.344	-0.427	-0.310
Age squared * No Year 12 and qualification	-0.171	0.051	-0.016	0.075

Source: Customised estimations from the 2001 Census.

Table 5A.23 Coefficient estimates for gross personal income – Five category education specification for those aged under 55 for those employed full-time

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Intercept	-223.925	-141.336	-336.938	-107.390
Age	40.547	34.321	50.476	35.991
Age squared	-0.459	-0.406	-0.561	-0.434
Degree	180.305	255.379	-1046.888	-708.905
Year 12 and qualification	-254.467	-202.685	-264.154	-302.252
Year 12 no qualification	-339.174	-275.531	-492.091	-413.584
No Year 12 and qualification	92.980	162.084	137.486	-15.350
Years since completed degree	10.521	6.005	8.560	0.384
Years since completed a qualification	2.717	3.910	-0.361	1.400
Age * Degree	6.183	2.136	81.515	58.079
Age * Year 12 and qualification	22.424	19.672	22.489	22.270
Age * Year 12 no qualification	23.498	23.023	33.518	29.659
Age * No Year 12 and qualification	3.758	-5.182	-0.387	3.002
Age squared * Degree	-0.018	0.007	-0.989	-0.692
Age squared * Year 12 and qualification	-0.256	-0.266	-0.218	-0.247
Age squared * Year 12 no qualification	-0.252	-0.324	-0.386	-0.389
Age squared * No Year 12 and qualification	-0.089	0.064	-0.004	-0.031

Source: Customised estimations from the 2001 Census.

Table 5A.24 Coefficient estimates for gross personal income – Five category education specification for those aged 55 years and over for those not employed and employed

Explanatory Variables	Indigenous Male	Indigenous Female	Non-Indigenous Male	Non-Indigenous Female
Not employed				
Intercept	92.051	-171.856	604.524	-578.659
Age	4.054	10.564	-11.618	20.694
Age squared	-0.033	-0.071	0.096	-0.127
Degree	1337.992	2663.515	193.545	350.159
Year 12 and qualification	-153.164	5023.180	400.693	-108.439
Year 12 no qualification	-23.194	-531.938	294.347	155.447
No Year 12 and qualification	1291.404	-1649.509	365.165	-67.096
Years since completed degree	-0.025	0.658	3.914	0.412
Years since completed a qualification	-0.321	-1.371	0.276	0.734
Age * Degree	-35.238	-79.114	-0.244	-7.987
Age * Year 12 and qualification	5.939	-153.937	-8.988	4.673
Age * Year 12 no qualification	3.879	17.471	-7.561	-4.631
Age * No Year 12 and qualification	-38.730	50.212	-8.976	2.381
Age squared * Degree	0.261	0.586	-0.001	0.070
Age squared * Year 12 and qualification	-0.036	1.194	0.065	-0.030
Age squared * Year 12 no qualification	-0.043	-0.137	0.062	0.043
Age squared * No Year 12 and qualification	0.298	-0.369	0.058	-0.018
Employed				
Intercept	3575.344	542.732	3024.316	1129.844
Age	-89.294	-2.267	-64.124	-19.300
Age squared	0.629	-0.002	0.410	0.136
Degree	2285.614	-522.917	2423.976	3357.592
Year 12 and qualification	439.903	-2601.651	2134.703	1360.714
Year 12 no qualification	9418.144	1021.395	1707.065	1137.225
No Year 12 and qualification	-1313.110	2576.817	955.510	-87.003
Years since completed degree	9.040	0.474	6.776	-2.968
Years since completed a qualification	2.520	2.671	-0.182	0.124
Age * Degree	-29.874	35.339	-49.470	-85.319
Age * Year 12 and qualification	-2.252	89.450	-53.199	-32.808
Age * Year 12 no qualification	-294.054	-23.990	-47.077	-31.806
Age * No Year 12 and qualification	44.679	-68.199	-25.594	7.000
Age squared * Degree	-0.021	-0.354	0.283	0.606
Age squared * Year 12 and qualification	-0.015	-0.693	0.366	0.215
Age squared * Year 12 no qualification	2.304	0.153	0.359	0.240
Age squared * No Year 12 and qualification	-0.335	0.458	0.187	-0.073

Source: Customised estimations from the 2001 Census.

Table 5A.25 Coefficient estimates for gross personal income – Five category education specification for those aged 55 years and over for those employed full-time

	Indigenous		Non-Indigenous	
Explanatory Variables	Male	Female	Male	Female
Intercept	2822.367	-1349.810	2268.497	863.148
Age	-63.369	61.572	-40.150	-4.739
Age squared	0.438	-0.498	0.237	0.001
Degree	2433.010	-4.012	1578.516	1431.749
Year 12 and qualification	-3158.889	7001.589	1523.857	644.443
Year 12 no qualification	8017.461	-906.875	2094.624	1344.804
No Year 12 and qualification	941.872	3630.164	1116.925	-57.174
Years since completed degree	12.013	3.164	6.585	-2.513
Years since completed a qualification	1.721	3.512	-0.287	0.168
Age * Degree	-35.047	5.576	-26.192	-27.129
Age * Year 12 and qualification	106.132	-242.721	-34.111	-11.146
Age * Year 12 no qualification	-235.775	36.935	-59.224	-39.619
Age * No Year 12 and qualification	-28.582	-103.429	-32.909	4.564
Age squared * Degree	0.002	-0.025	0.152	0.191
Age squared * Year 12 and qualification	-0.820	2.145	0.227	0.062
Age squared * Year 12 no qualification	1.721	-0.335	0.459	0.314
Age squared * No Year 12 and qualification	0.251	0.730	0.267	-0.033

Source: Customised estimations from the 2001 Census.

5A.4 Variation in lifetime income and employment by population subgroup

Table 5A.26 Average lifetime employment probability by high school completion and population subgroup

	Remote/ non-remote	*Disability/ no disability*	*Difficulty/ no difficulty*
Males			
Not in subgroup			
Year 9 or less	0.408	0.614	0.515
Year 10 or 11	0.626	0.715	0.695
Year 12	0.728	0.792	0.742
In subgroup			
Year 9 or less	0.581	0.357	0.434
Year 10 or 11	0.747	0.599	0.528
Year 12	0.742	0.599	0.642
Females			
Not in subgroup			
Year 9 or less	0.248	0.378	0.340
Year 10 or 11	0.433	0.522	0.500
Year 12	0.595	0.648	0.642
In subgroup			
Year 9 or less	0.387	0.248	0.262
Year 10 or 11	0.567	0.409	0.401
Year 12	0.635	0.529	0.328

Source: Customised calculations from the 2002 NATSISS. Coefficient estimates are given in Table 5A.30 and 5A.31

Table 5A.27 Average lifetime employment probability by high school completion and age when had first child

	Age when had first child				
	Aged 18	Aged 21	Aged 25	Aged 30	No children
Year 9 or less	0.308	0.326	0.336	0.348	0.322
Year 10 or 11	0.440	0.464	0.492	0.531	0.653
Year 12	0.533	0.575	0.601	0.645	0.768

Source: Customised calculations from the 2002 NATSISS. Coefficient estimates are given in Table 5A.36

Table 5A.28 Lifetime income by high school completion and population subgroup

	Remote/ non-remote	*CDEP/ non-CDEP*	*Disability/ no disability*	*Difficulty/ no difficulty*
Males				
Not in subgroup				
Year 9 or less	1,008,413	1,221,288	865,609	875,895
Year 10 or 11	1,184,125	1,348,257	1,146,815	1,137,141
Year 12	1,351,384	1,373,619	1,208,154	1,210,846
In subgroup				
Year 9 or less	738,886	529,451	790,848	687,448
Year 10 or 11	1,024,797	613,436	1,025,750	851,738
Year 12	963,822	689,795	1,136,476	914,840
Females				
Not in subgroup				
Year 9 or less	888,752	948,185	804,070	804,590
Year 10 or 11	936,008	1,026,021	935,455	944,978
Year 12	1,236,541	1,209,215	1,161,775	1,153,411
In subgroup				
Year 9 or less	717,986	611,432	735,903	680,087
Year 10 or 11	918,903	677,871	906,591	756,595
Year 12	968,061	776,188	1,089,883	837,327

Source: Customised calculations from the 2002 NATSISS. Coefficient estimates are given in Table 5A.32 to 5A.35

Table 5A.29 Average lifetime employment probability by high school completion and age when had first child

	Age when had first child					
	Aged 15	Aged 18	Aged 21	Aged 25	Aged 30	No children
Year 9 or less	799,563	803,917	797,617	774,797	762,280	689,981
Year 10 or 11	936,922	935,861	928,951	920,971	925,716	922,643
Year 12	1,123,096	1,101,849	1,089,903	1,114,849	1,142,145	1,302,300

Source: Customised calculations from the 2002 NATSISS. Coefficient estimates are given in Table 5A.36

5A.5 Coefficient estimates – 2002 NATSISS

Coefficient estimates based on the 2002 NATSISS used to generate the above tables are given in the following tables along with p-values for the significance tests on whether that value is different from zero. The third last line of the table gives Pseudo R-squared for the employment estimates and the Adjusted R-Squared for the income estimates and the second last line the sample size. The last line gives the lowest level of significance (1%, 5% or 10%) for which I was able to reject the null joint hypothesis that $\left(\gamma_{7,1}, \gamma_{7,2} \neq 0\right)$. Those cells represented by a n.s. are those hypothesis tests for which it was not possible to reject the null hypothesis (of zero coefficients) at even the 10% level of significance. The ‘not applicable’ cells (labelled n.a.) are those for which no estimation was carried out. The results for males and females are presented separately.

Table 5A.30 Coefficients and p-values for probability of employment by population subgroup - Males

	Remote/non-remote		*Disability/no disability*		*Difficulty/no difficulty*	
Explanatory variables	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value
Intercept	-1.0858	0.002	-0.9322	0.008	-0.8682	0.013
Age	0.0413	0.052	0.0548	0.011	0.0467	0.027
Age Squared	-0.0005	0.134	-0.0005	0.082	-0.0006	0.068
Year 10 or 11	0.9051	0.073	0.9263	0.066	0.8966	0.074
Year 10 or 11 * age	-0.0252	0.424	-0.0364	0.250	-0.0292	0.352
Year 10 or 11 * age squared	0.0004	0.394	0.0005	0.310	0.0004	0.334
Year 12	0.2245	0.771	0.2278	0.770	0.0470	0.951
Year 12 * age	0.0521	0.287	0.0345	0.486	0.0480	0.327
Year 12 * age squared	-0.0009	0.220	-0.0007	0.361	-0.0008	0.258
Subgroup	0.4377	0.000	-0.6654	0.000	-0.2036	0.022
Subgroup * Year 10 or 11	-0.0886	0.378	0.3418	0.001	-0.2396	0.074
Subgroup * Year 12	-0.3942	0.005	0.1002	0.527	-0.0849	0.682
Hypothesis test results	<0.05		<0.10		n.s.	
Pseudo R-squared	0.049		0.060		0.040	
Sample size	3,196		3,196		3,191	

Source: Customised calculations from the 2002 NATSISS.

Table 5A.31 Coefficients and p-values for probability of employment by population subgroup - Females

	Remote/non-remote		*Disability/no disability*		*Difficulty/no difficulty*	
Explanatory variables	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value
Intercept	-2.1869	0.000	-1.8720	0.000	-1.7966	0.000
Age	0.0704	0.001	0.0717	0.001	0.0653	0.003
Age Squared	-0.0007	0.015	-0.0007	0.015	-0.0007	0.022
Year 10 or 11	1.2041	0.017	1.1121	0.025	1.0872	0.029
Year 10 or 11 * age	-0.0528	0.081	-0.0539	0.074	-0.0514	0.088
Year 10 or 11 * age squared	0.0009	0.048	0.0009	0.049	0.0008	0.053
Year 12	0.9041	0.186	0.7025	0.302	0.4955	0.469
Year 12 * age	0.0264	0.536	0.0231	0.588	0.0398	0.353
Year 12 * age squared	-0.0007	0.303	-0.0006	0.355	-0.0008	0.202
Subgroup	0.4013	0.000	-0.3789	0.000	-0.2307	0.005
Subgroup * Year 10 or 11	-0.0508	0.572	0.0815	0.392	-0.0278	0.819
Subgroup * Year 12	-0.2941	0.014	0.0694	0.591	-0.5887	0.002
Hypothesis test results	<0.05		n.s.		<0.01	
Pseudo R-squared	0.061		0.059		0.056	
Sample size	4,264		4,264		4,255	

Source: Customised calculations from the 2002 NATSISS.

Table 5A.32 Coefficients and p-values for gross personal income by population subgroup - Males

	Remote/non-remote		*CDEP/non-CDEP*		*Disability/no disability*		*Difficulty/no difficulty*	
Explanatory variables	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value
Intercept	176.95	0.184	347.78	0.003	117.52	0.384	133.98	0.319
Age	12.17	0.124	12.09	0.078	10.92	0.175	10.97	0.170
Age Squared	-0.08	0.443	-0.13	0.160	-0.06	0.598	-0.07	0.536
Year 10 or 11	-369.03	0.034	-316.68	0.037	-348.44	0.048	-358.39	0.041
Year 10 or 11 * age	24.94	0.018	19.94	0.030	26.70	0.013	26.81	0.012
Year 10 or 11 * age squared	-0.30	0.045	-0.23	0.084	-0.33	0.034	-0.33	0.032
Year 12	-783.40	0.001	-777.57	0.000	-794.93	0.001	-807.47	0.001
Year 12 * age	60.11	0.000	50.75	0.000	60.14	0.000	61.18	0.000
Year 12 * age squared	-0.84	0.000	-0.66	0.001	-0.83	0.000	-0.85	0.000
Subgroup	-129.58	0.000	-332.61	0.000	-35.94	0.184	-90.60	0.006
Subgroup * Year 10 or 11	51.15	0.113	-29.62	0.304	-23.65	0.508	-50.32	0.289
Subgroup * Year 12	-71.43	0.081	-22.49	0.553	-1.00	0.984	-63.86	0.324
Hypothesis test results	<0.01		n.s.		n.s.		n.s.	
Adjusted R-squared	0.165		0.371		0.134		0.145	
Sample size	1,932		1,932		1,932		1,932	

Source: Customised calculations from the 2002 NATSISS.

Table 5A.33 Coefficients and p-values for gross personal income by population subgroup - Females

	Remote/non-remote		*CDEP/non-CDEP*		*Disability/no disability*		*Difficulty/no difficulty*	
Explanatory variables	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value
Intercept	19.86	0.882	149.12	0.251	-20.83	0.877	-4.19	0.975
Age	20.35	0.008	15.62	0.034	19.67	0.011	18.86	0.015
Age Squared	-0.22	0.034	-0.18	0.081	-0.20	0.053	-0.20	0.063
Year 10 or 11	-254.88	0.121	-248.36	0.120	-219.78	0.185	-230.45	0.163
Year 10 or 11 * age	15.24	0.116	16.84	0.070	16.12	0.100	17.27	0.076
Year 10 or 11 * age squared	-0.18	0.177	-0.22	0.096	-0.20	0.141	-0.22	0.107
Year 12	-636.02	0.002	-756.86	0.000	-644.08	0.002	-672.67	0.001
Year 12 * age	49.16	0.000	53.21	0.000	49.40	0.000	51.42	0.000
Year 12 * age squared	-0.66	0.000	-0.71	0.000	-0.66	0.000	-0.70	0.000
Subgroup	-82.10	0.000	-161.90	0.000	-32.77	0.166	-59.86	0.040
Subgroup * Year 10 or 11	73.59	0.010	-9.67	0.734	18.72	0.540	-33.16	0.414
Subgroup * Year 12	-57.69	0.081	-62.85	0.080	-4.03	0.913	-104.83	0.084
Hypothesis test results	<0.01		n.s.		n.s.		n.s.	
Adjusted R-squared	0.174		0.232		0.1543		0.164	
Sample size	1,836		1,836		1,836		1,836	

Source: Customised calculations from the 2002 NATSISS.

Table 5A.34 Coefficients and p-values for gross personal income by population subgroup – Male high school students

	Remote/non-remote		*Disability/no disability*		*Difficulty/no difficulty*	
Explanatory variables	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value
Intercept	-8206.42	0.000	-8245.80	0.000	-8124.99	0.000
Age	1006.34	0.000	1011.09	0.000	995.64	0.000
Age Squared	-30.56	0.000	-30.70	0.000	-30.22	0.000
Subgroup	-5.20	0.444	-3.90	0.592	7.53	0.494
Adjusted R-squared	0.294		0.284		0.284	
Sample size	229		229		229	

Source: Customised calculations from the 2002 NATSISS.

Table 5A.35 Coefficients and p-values for gross personal income by population subgroup – Female high school students

	Remote/non-remote		*Disability/no disability*		*Difficulty/no difficulty*	
Explanatory variables	Coeffic.	P-value	Coeffic.	P-value	Coeffic.	P-value
Intercept	-4703.79	0.012	-4692.68	0.012	-4660.69	0.013
Age	564.04	0.017	563.07	0.017	558.76	0.018
Age Squared	-16.60	0.025	-16.58	0.025	-16.44	0.026
Subgroup	3.04	0.678	-6.99	0.382	4.97	0.616
Adjusted R-squared	0.215		0.208		0.206	
Sample size	246		248		248	

Source: Customised calculations from the 2002 NATSISS.

Table 5A.36 Coefficients and p-values for probability of employment and gross personal income by age of when had first child – Females

Explanatory variables	Probability of employment Coeffic.	P-value	Gross personal income Coeffic.	P-value
Intercept	-0.8540	0.066	21.39	0.898
Age	0.0187	0.497	14.63	0.140
Age Squared	-0.0002	0.569	-0.15	0.244
Year 10 or 11	-0.0205	0.974	-285.34	0.157
Year 10 or 11 * age	0.0325	0.394	22.28	0.067
Year 10 or 11 * age squared	-0.0002	0.699	-0.28	0.083
Year 12	-1.0507	0.216	-923.87	0.000
Year 12 * age	0.1464	0.006	70.29	0.000
Year 12 * age squared	-0.0021	0.004	-0.90	0.000
Has children	0.1053	0.406	55.61	0.231
Has children * Year 10 or 11	-0.5869	0.001	-53.25	0.329
Has children * Year 12	-0.6484	0.004	-178.81	0.004
Has children * Aged 15-17	-1.0770	0.038	-83.52	0.747
Has children * Aged 15-17 * Year 10 or 11	0.3462	0.647	23.26	0.949
Has children * Aged 18-20	-1.1010	0.001	-15.23	0.921
Has children * Aged 18-20 * Year 10 or 11	0.7050	0.064	57.16	0.736
Has children * Aged 18-20 * Year 12	0.1475	0.774	215.00	0.319
Has children * Aged 21-24	-0.3966	0.034	41.78	0.558
Has children * Aged 21-24 * Year 10 or 11	0.1926	0.405	-17.10	0.837
Has children * Aged 21-24 * Year 12	0.2458	0.418	-35.52	0.706
Has children * Aged 25-29	-0.3924	0.005	-7.47	0.886
Has children * Aged 25-29 * Year 10 or 11	0.1058	0.544	-13.14	0.833
Has children * Aged 25-29 * Year 12	0.0248	0.909	25.68	0.705
Hypothesis test results	<0.01		<0.01	
Pseudo/Adjusted R-squared*	0.076		0.157	
Sample size	4,264		1,836	

Source: Customised calculations from the 2002 NATSISS.
Note: * Pseudo R-Squared refers to the probability of employment estimations and Adjusted R-Squared to the gross personal income estimations

5A.6 Coefficient estimates and standard errors – 2001 NHS

The following tables give the coefficient estimates and the standard errors for the relationship between health and education presented in Section 5.5.3. More detail for the models can be found in Biddle (2006b).

Table 5A.36 Coefficient estimates and standard errors for the relationship between high school completion and three measures of low health

	Self assessed health fair or poor		Has a chronic condition		Reported risky alcohol consumption	
Independent variable	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Female	-0.0689	0.0260	0.1352	0.0224	-0.1334	0.0226
Born overseas	0.0453	0.0314	-0.1601	0.0274	-0.2680	0.0285
Not married	0.1864	0.0272	0.0776	0.0234	0.2180	0.0235
Lives in inner regional area	-0.0526	0.0336	-0.0124	0.0291	0.0484	0.0296
Lives in outer regional area	0.0173	0.0397	-0.0340	0.0354	0.1276	0.0354
Lives in remote Australia	-0.1262	0.0735	-0.0940	0.0655	0.2481	0.0639
Age	0.0329	0.0146	-0.0211	0.0126	0.0181	0.0128
Age squared	-0.0002	0.0002	0.0006	0.0001	-0.0004	0.0001
Indigenous status	-0.2830	0.6822	-0.9216	0.6419	-1.4274	0.6301
Indigenous status * age	0.0182	0.0330	0.0546	0.0317	0.0769	0.0314
Indigenous status * age squared	-0.0001	0.0004	-0.0006	0.0004	-0.0009	0.0004
Completed high school	0.1590	0.3490	0.0382	0.3067	0.3327	0.3022
Completed high school * Indigenous status	-0.7258	1.3385	0.2438	1.1555	1.5512	1.1472
Completed high school * age	-0.0272	0.0168	-0.0080	0.0149	-0.0212	0.0150
Completed high school * age squared	0.0004	0.0002	0.0001	0.0002	0.0003	0.0002
Completed high school * Indigenous status * age	0.0504	0.0736	-0.0143	0.0641	-0.0990	0.0641
Completed high school * Indigenous status * age squared	-0.0007	0.0010	0.0002	0.0009	0.0014	0.0009
Equivalised income	-0.0001	0.0002	0.0001	0.0001	0.0003	0.0001
Equivalised income squared	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Equivalised income * age	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Equivalised income * age squared	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Constant	-1.6371	0.3107	-0.5268	0.2693	-0.6214	0.2672
Adjusted R-squared	0.0801		0.0696		0.0324	

Table 5A.37 Coefficient estimates and standard errors for the relationship between high school completion and four measures of low health

Independent variable	Unhealthy weight Coefficient	Unhealthy weight Standard error	Low exercise Coefficient	Low exercise Standard error	Current smoker Coefficient	Current smoker Standard error	Ever was a smoker Coefficient	Ever was a smoker Standard error
Female	-0.2646	0.0220	-0.0446	0.0229	-0.1713	0.0235	-0.2137	0.0218
Born overseas	-0.1933	0.0264	0.1859	0.0275	-0.0365	0.0292	-0.0982	0.0262
Not married	-0.0792	0.0229	-0.0826	0.0241	0.3743	0.0246	0.1645	0.0229
Lives in inner regional area	0.0646	0.0286	-0.0281	0.0299	-0.0058	0.0308	0.0076	0.0285
Lives in outer regional area	0.0775	0.0350	0.0111	0.0357	0.1247	0.0363	0.0728	0.0348
Lives in remote Australia	0.2529	0.0673	0.0218	0.0659	0.1924	0.0658	0.0559	0.0647
Age	0.0278	0.0121	0.0475	0.0130	0.0249	0.0130	0.0084	0.0122
Age squared	-0.0002	0.0001	-0.0005	0.0001	-0.0006	0.0001	-0.0002	0.0001
Indigenous status	1.0381	0.6286	0.0875	0.6098	-0.2391	0.6115	-0.2576	0.6298
Indigenous status * age	-0.0308	0.0314	-0.0051	0.0300	0.0220	0.0302	0.0206	0.0311
Indigenous status * age squared	0.0003	0.0004	0.0002	0.0004	-0.0002	0.0004	-0.0002	0.0004
Completed high school	0.1827	0.2933	-0.4528	0.3100	-1.1095	0.3124	-1.5723	0.2958
Completed high school * Indigenous status	1.1473	1.3506	-0.0487	1.2098	-0.9383	1.1747	0.7291	1.1439
Completed high school * age	-0.0201	0.0144	0.0052	0.0152	0.0248	0.0156	0.0446	0.0144
Completed high school * age squared	0.0003	0.0002	-0.0001	0.0002	-0.0001	0.0002	-0.0003	0.0002
Completed high school * Indigenous status * age	-0.0804	0.0796	0.0072	0.0671	0.0707	0.0661	-0.0287	0.0640
Completed high school * Indigenous status * age squared	0.0014	0.0011	-0.0001	0.0009	-0.0010	0.0009	0.0003	0.0009
Equivalised income	-0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	-0.0001	0.0001
Equivalised income squared	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Equivalised income * age	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Equivalised income * age squared	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Constant	-0.3234	0.2564	-1.1880	0.2750	-0.3631	0.2717	0.4696	0.2625
Adjusted R-squared	0.0391		0.0322		0.0764		0.0416	

Appendix 6 Employment and income benefits of education by ARIA and SLA

The first section of this appendix gives the predicted employment and income benefits of education by ARIA in tabular form, as well as the average probabilities of employment and lifetime that they are based on.

Section 6A.2 gives the co-efficient estimates and p-values for the models looking at the factors associated with the employment and income benefits of education in the SLA. It should be noted that because a separate intercept was estimated for each SLA in the models that these estimates of the benefits of education are based on, it was not possible to tabulate the co-efficient estimates and p-values in an appendix. They are instead made available in the accompanying spreadsheet.

6A.1 Lifetime employment and income benefits of education by ARIA

Table 6A.1 Predicted employment benefits of education by remoteness classification

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 – other quals to no quals	1.47	1.57	1.54	1.76	1.55
No quals – Year 12 to no Year 12	1.42	1.36	1.38	1.47	1.34
Year 12 – other quals to no quals	1.13	1.26	1.22	1.23	1.23
Year 12 – degree to no quals	1.21	1.30	1.25	1.27	1.32
Indigenous female					
No Year 12 – other quals to no quals	1.79	1.79	1.74	1.87	1.86
No quals – Year 12 to no Year 12	1.72	1.56	1.48	1.69	1.54
Year 12 – other quals to no quals	1.20	1.32	1.34	1.18	1.35
Year 12 – degree to no quals	1.30	1.61	1.50	1.52	1.50
Non-Indigenous male					
No Year 12 – other quals to no quals	1.22	1.21	1.20	1.11	1.11
No quals – Year 12 to no Year 12	1.16	1.17	1.16	1.11	1.09
Year 12 – other quals to no quals	1.07	1.06	1.06	1.02	1.03
Year 12 – degree to no quals	1.10	1.10	1.10	1.06	1.06
Non-Indigenous female					
No Year 12 – other quals to no quals	1.26	1.27	1.29	1.22	1.14
No quals – Year 12 to no Year 12	1.25	1.25	1.27	1.21	1.14
Year 12 – other quals to no quals	1.11	1.13	1.14	1.12	1.07
Year 12 – degree to no quals	1.20	1.23	1.23	1.20	1.11

Table 6A.2 Lifetime average probability of employment by education completion and remoteness classification

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 and no qualifications	0.531	0.497	0.488	0.471	0.540
No Year 12 and has a qualification	0.768	0.767	0.733	0.812	0.825
Year 12 and no qualifications	0.733	0.654	0.659	0.680	0.705
Year 12 and non-degree qualification	0.826	0.829	0.805	0.836	0.872
Year 12 and degree	0.887	0.849	0.822	0.862	0.931
Indigenous female					
No Year 12 and no qualifications	0.379	0.355	0.358	0.327	0.381
No Year 12 and has a qualification	0.663	0.617	0.606	0.597	0.694
Year 12 and no qualifications	0.619	0.519	0.500	0.536	0.565
Year 12 and non-degree qualification	0.744	0.688	0.672	0.627	0.764
Year 12 and degree	0.804	0.836	0.748	0.815	0.849
Non-Indigenous male					
No Year 12 and no qualifications	0.745	0.742	0.744	0.825	0.840
No Year 12 and has a qualification	0.897	0.890	0.882	0.908	0.926
Year 12 and no qualifications	0.852	0.858	0.856	0.907	0.913
Year 12 and non-degree qualification	0.907	0.913	0.908	0.927	0.934
Year 12 and degree	0.937	0.944	0.944	0.965	0.966
Non-Indigenous female					
No Year 12 and no qualifications	0.577	0.568	0.568	0.615	0.679
No Year 12 and has a qualification	0.711	0.702	0.714	0.727	0.755
Year 12 and no qualifications	0.692	0.682	0.690	0.713	0.748
Year 12 and non-degree qualification	0.768	0.772	0.785	0.802	0.802
Year 12 and degree	0.829	0.836	0.851	0.854	0.830

Table 6A.3 Predicted full-time employment benefits of education by remoteness classification

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 – other quals to no quals	1.65	1.86	1.94	2.53	3.12
No quals – Year 12 to no Year 12	1.55	1.49	1.62	1.79	1.76
Year 12 – other quals to no quals	1.20	1.40	1.35	1.50	1.86
Year 12 – degree to no quals	1.29	1.39	1.31	1.68	2.62
Indigenous female					
No Year 12 – other quals to no quals	2.16	2.16	2.33	3.45	3.97
No quals – Year 12 to no Year 12	2.22	2.12	1.99	2.60	2.51
Year 12 – other quals to no quals	1.21	1.30	1.45	1.48	1.94
Year 12 – degree to no quals	1.39	1.75	2.10	1.99	2.01
Non-Indigenous male					
No Year 12 – other quals to no quals	1.22	1.21	1.20	1.11	1.11
No quals – Year 12 to no Year 12	1.16	1.17	1.16	1.11	1.09
Year 12 – other quals to no quals	1.07	1.06	1.06	1.02	1.03
Year 12 – degree to no quals	1.10	1.10	1.10	1.06	1.06
Non-Indigenous female					
No Year 12 – other quals to no quals	1.30	1.37	1.42	1.38	1.27
No quals – Year 12 to no Year 12	1.47	1.49	1.51	1.41	1.36
Year 12 – other quals to no quals	1.09	1.15	1.18	1.24	1.12
Year 12 – degree to no quals	1.28	1.37	1.38	1.44	1.25

Table 6A.4 Lifetime average probability of full-time employment by education completion and remoteness classification

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 and no qualifications	0.384	0.339	0.299	0.249	0.198
No Year 12 and has a qualification	0.623	0.620	0.558	0.623	0.604
Year 12 and no qualifications	0.578	0.490	0.469	0.432	0.324
Year 12 and non-degree qualification	0.691	0.685	0.633	0.638	0.610
Year 12 and degree	0.745	0.682	0.615	0.725	0.848
Indigenous female					
No Year 12 and no qualifications	0.185	0.143	0.141	0.125	0.112
No Year 12 and has a qualification	0.381	0.292	0.312	0.419	0.431
Year 12 and no qualifications	0.387	0.284	0.259	0.310	0.263
Year 12 and non-degree qualification	0.465	0.368	0.378	0.455	0.513
Year 12 and degree	0.537	0.497	0.544	0.617	0.528
Non-Indigenous male					
No Year 12 and no qualifications	0.589	0.586	0.589	0.679	0.688
No Year 12 and has a qualification	0.771	0.758	0.748	0.777	0.796
Year 12 and no qualifications	0.699	0.702	0.708	0.785	0.787
Year 12 and non-degree qualification	0.778	0.781	0.776	0.802	0.818
Year 12 and degree	0.822	0.817	0.820	0.864	0.867
Non-Indigenous female					
No Year 12 and no qualifications	0.285	0.240	0.249	0.282	0.350
No Year 12 and has a qualification	0.348	0.306	0.330	0.367	0.422
Year 12 and no qualifications	0.404	0.342	0.357	0.374	0.451
Year 12 and non-degree qualification	0.435	0.388	0.420	0.465	0.503
Year 12 and degree	0.516	0.469	0.493	0.538	0.562

Table 6A.5 Predicted occupation benefits of education by remoteness classification

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 – other quals to no quals	1.37	1.49	1.53	2.35	2.22
No quals – Year 12 to no Year 12	2.15	1.87	2.08	1.72	2.10
Year 12 – other quals to no quals	1.16	1.40	1.30	1.65	1.50
Year 12 – degree to no quals	2.37	2.93	2.77	3.31	3.19
Indigenous female					
No Year 12 – other quals to no quals	1.99	2.27	2.55	2.40	2.68
No quals – Year 12 to no Year 12	1.66	1.69	1.79	1.21	1.39
Year 12 – other quals to no quals	1.51	1.82	1.58	2.40	2.55
Year 12 – degree to no quals	2.45	2.80	2.70	3.55	3.37
Non-Indigenous male					
No Year 12 – other quals to no quals	1.24	1.15	1.07	0.96	0.98
No quals – Year 12 to no Year 12	2.01	2.06	1.77	1.72	1.79
Year 12 – other quals to no quals	1.13	1.09	1.06	0.90	0.92
Year 12 – degree to no quals	2.12	2.03	1.95	1.73	1.97
Non-Indigenous female					
No Year 12 – other quals to no quals	1.66	1.76	1.76	1.68	1.69
No quals – Year 12 to no Year 12	1.60	1.63	1.51	1.47	1.54
Year 12 – other quals to no quals	1.62	1.77	1.75	1.66	1.53
Year 12 – degree to no quals	2.71	2.82	2.62	2.35	2.33

Table 6A.6 Lifetime average probability of employment as a manager, professional or semi-professional by education completion and remoteness classification

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 and no qualifications	0.161	0.157	0.151	0.127	0.105
No Year 12 and has a qualification	0.222	0.236	0.234	0.300	0.242
Year 12 and no qualifications	0.347	0.290	0.316	0.221	0.221
Year 12 and non-degree qualification	0.402	0.403	0.412	0.357	0.332
Year 12 and degree	0.824	0.850	0.876	0.731	0.705
Indigenous female					
No Year 12 and no qualifications	0.210	0.184	0.187	0.200	0.175
No Year 12 and has a qualification	0.426	0.427	0.490	0.500	0.484
Year 12 and no qualifications	0.348	0.309	0.333	0.239	0.241
Year 12 and non-degree qualification	0.527	0.569	0.530	0.581	0.623
Year 12 and degree	0.853	0.865	0.899	0.846	0.811
Non-Indigenous male					
No Year 12 and no qualifications	0.208	0.214	0.261	0.306	0.257
No Year 12 and has a qualification	0.258	0.245	0.274	0.288	0.251
Year 12 and no qualifications	0.413	0.437	0.459	0.525	0.459
Year 12 and non-degree qualification	0.467	0.476	0.485	0.472	0.421
Year 12 and degree	0.878	0.888	0.895	0.907	0.904
Non-Indigenous female					
No Year 12 and no qualifications	0.188	0.186	0.217	0.246	0.242
No Year 12 and has a qualification	0.320	0.332	0.389	0.417	0.410
Year 12 and no qualifications	0.301	0.301	0.327	0.358	0.368
Year 12 and non-degree qualification	0.492	0.539	0.578	0.599	0.565
Year 12 and degree	0.817	0.849	0.856	0.842	0.858

Table 6A.7 Predicted income benefits of education for those employed by remoteness classification – Internal rate of return

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 – other quals to no quals	0.20	0.27	0.31	0.34	0.77
No quals – Year 12 to no Year 12	0.10	0.10	0.10	0.10	0.21
Year 12 – other quals to no quals	0.09	0.14	0.18	0.25	0.46
Year 12 – degree to no quals	0.16	0.15	0.23	0.98	0.33
Indigenous female					
No Year 12 – other quals to no quals	0.15	0.19	0.28	0.43	0.85
No quals – Year 12 to no Year 12	0.10	0.09	0.12	0.11	0.21
Year 12 – other quals to no quals	0.07	0.10	0.12	0.16	0.46
Year 12 – degree to no quals	0.14	0.17	0.20	0.20	0.48
Non-Indigenous male					
No Year 12 – other quals to no quals	0.20	0.23	0.19	0.19	0.31
No quals – Year 12 to no Year 12	0.10	0.09	0.07	0.05	0.06
Year 12 – other quals to no quals	0.09	0.13	0.12	0.16	0.24
Year 12 – degree to no quals	0.17	0.16	0.16	0.17	0.15
Non-Indigenous female					
No Year 12 – other quals to no quals	0.09	0.11	0.10	0.10	0.11
No quals – Year 12 to no Year 12	0.08	0.08	0.07	0.06	0.07
Year 12 – other quals to no quals	0.06	0.09	0.09	0.09	0.08
Year 12 – degree to no quals	0.14	0.14	0.16	0.17	0.19

Table 6A.8 Lifetime income for those employed by education completion and remoteness classification

	Major City	Inner Regional	Outer Regional	Remote	Very remote
Indigenous male					
No Year 12 and no qualifications	962,344	894,810	811,043	756,212	567,573
No Year 12 and has a qualification	1,131,782	1,052,543	973,312	1,081,083	1,147,207
Year 12 and no qualifications	1,236,321	1,099,667	991,115	934,940	756,625
Year 12 and non-degree qualification	1,364,046	1,283,946	1,154,755	1,222,864	1,262,286
Year 12 and degree	1,790,589	1,581,025	1,516,632	1,410,166	1,647,705
Indigenous female					
No Year 12 and no qualifications	917,717	842,291	787,456	762,215	613,735
No Year 12 and has a qualification	1,109,233	964,080	1,007,233	1,115,581	1,135,371
Year 12 and no qualifications	1,138,740	939,551	970,527	875,997	826,050
Year 12 and non-degree qualification	1,233,152	1,167,404	1,108,630	2,047,167	1,362,680
Year 12 and degree	1,492,805	1,309,283	1,431,679	1,292,571	1,481,554
Non-Indigenous male					
No Year 12 and no qualifications	1,457,632	1,412,191	1,362,182	1,521,670	1,701,866
No Year 12 and has a qualification	1,722,747	1,613,971	1,489,646	1,716,644	1,997,245
Year 12 and no qualifications	1,872,384	1,783,103	1,604,950	1,712,491	1,941,669
Year 12 and non-degree qualification	2,076,975	1,979,804	1,773,660	1,904,010	2,221,260
Year 12 and degree	3,005,503	2,706,912	2,507,965	2,542,958	2,862,524
Non-Indigenous female					
No Year 12 and no qualifications	1,458,530	1,316,211	1,283,529	1,334,216	1,430,779
No Year 12 and has a qualification	1,612,484	1,447,137	1,384,852	1,495,362	1,438,240
Year 12 and no qualifications	1,753,161	1,546,902	1,489,095	1,494,230	1,765,030
Year 12 and non-degree qualification	1,917,720	1,769,600	1,682,831	1,680,864	1,866,112
Year 12 and degree	2,406,628	1,991,411	1,896,062	1,758,906	2,091,200

6A.2 Factors associated with the predicted employment benefits of education by geography

Table 6A.9 Factors associated with the employment benefits of education in the SLA – Indigenous males

	Specification 1		Specification 2	
	Coeffic.	P-value	Coeffic.	P-value
Victoria	-1.120	0.000	-0.943	0.000
Queensland	-1.833	0.000	-0.699	0.000
South Australia	-0.804	0.000	-0.911	0.000
Western Australia	-1.265	0.000	-0.493	0.000
Tasmania	-2.190	0.000	-2.700	0.000
Northern Territory	1.625	0.000	1.039	0.000
Australian Capital Territory	1.402	0.000	1.401	0.000
Inner regional	0.288	0.000	-0.005	0.943
Outer regional	0.230	0.015	0.047	0.594
Remote	1.696	0.000	1.589	0.000
Very remote	0.035	0.817	-0.095	0.507
Aged 15 to 24	6.684	0.000	13.319	0.000
Aged 25 to 34	6.445	0.000	12.185	0.000
Speaks English not well or not at all	8.692	0.000	5.499	0.000
Couple without children	-0.640	0.327	-1.875	0.002
Single parent with children	10.781	0.000	7.436	0.000
Other family type	9.798	0.000	6.903	0.000
Never married	4.057	0.000	4.164	0.000
Widowed/separated/divorced	-3.281	0.000	-4.750	0.000
Moved in the last 5 years	-5.567	0.000	-8.044	0.000
Employed by the government	4.930	0.000	-4.190	0.000
Employed in agriculture	-2.606	0.000	-5.995	0.000
Employed in mining	-1.510	0.004	0.765	0.121
Employed in manufacturing	-0.031	0.947	1.454	0.001
Employed in retail or hospitality	7.831	0.000	3.640	0.001
CDEP scheme in the area	0.031	0.661	0.230	0.001
Proportion employed in CDEP scheme	-0.252	0.160	-1.268	0.000
Completed Year 12	n.a.	n.a.	-8.223	0.000
Has qualifications (those completed Year 12)	n.a.	n.a.	12.593	0.000
Has qualifications (those not completed Year 12)	n.a.	n.a.	-12.311	0.000
Constant	0.202	0.710	-0.955	0.074
Adjusted R-squared	0.2143		0.3175	
Effective sample size	22,478		22,478	

Table 6A.10 Factors associated with the employment benefits of education in the SLA – Non-Indigenous males

	Specification 1		Specification 2	
	Coeffic.	P-value	Coeffic.	P-value
Victoria	0.127	0.000	-1.373	0.000
Queensland	-0.333	0.000	-0.552	0.000
South Australia	-0.225	0.000	-1.220	0.000
Western Australia	-0.392	0.000	-0.120	0.000
Tasmania	-0.372	0.000	-0.601	0.000
Northern Territory	-1.940	0.000	-2.452	0.000
Australian Capital Territory	-1.146	0.000	-1.741	0.000
Inner regional	0.186	0.000	0.283	0.000
Outer regional	0.278	0.000	0.272	0.000
Remote	-0.315	0.000	-0.169	0.000
Very remote	-1.071	0.000	-0.857	0.000
Aged 15 to 24	-10.751	0.000	-7.426	0.000
Aged 25 to 34	-5.881	0.000	-5.277	0.000
Speaks English not well or not at all	16.024	0.000	-1.768	0.000
Couple without children	7.775	0.000	9.534	0.000
Single parent with children	27.150	0.000	10.825	0.000
Other family type	10.665	0.000	9.120	0.000
Never married	-1.246	0.000	-0.644	0.000
Widowed/separated/divorced	9.026	0.000	9.074	0.000
Moved in the last 5 years	2.865	0.000	-1.636	0.000
Employed by the government	6.330	0.000	3.986	0.000
Employed in agriculture	4.632	0.000	4.946	0.000
Employed in mining	1.382	0.000	2.000	0.000
Employed in manufacturing	3.010	0.000	0.206	0.000
Employed in retail or hospitality	-7.858	0.000	1.680	0.000
CDEP scheme in the area	0.315	0.000	0.158	0.000
Proportion employed in CDEP scheme	-0.597	0.000	-0.319	0.000
Completed Year 12	n.a.	n.a.	-8.477	0.000
Has qualifications (those completed Year 12)	n.a.	n.a.	1.787	0.000
Has qualifications (those not completed Year 12)	n.a.	n.a.	-8.098	0.000
Constant	-2.182	0.000	5.758	0.000
Adjusted R-squared	0.6441		0.7444	
Effective sample size	652,178		652,178	

Table 6A.11 Factors associated with the income benefits of education for those employed in the SLA – Indigenous males

	Specification 1		Specification 2	
	Coeffic.	P-value	Coeffic.	P-value
Victoria	-24604	0.000	-21646	0.000
Queensland	-11251	0.000	4304	0.018
South Australia	-21188	0.000	-22523	0.000
Western Australia	-8032	0.000	5116	0.016
Tasmania	4213	0.161	-2641	0.364
Northern Territory	-3964	0.153	-11548	0.000
Australian Capital Territory	23740	0.000	17129	0.003
Inner regional	7218	0.000	3001	0.076
Outer regional	8726	0.000	6502	0.001
Remote	4785	0.147	4905	0.124
Very remote	14545	0.000	13260	0.000
Aged 15 to 24	-208447	0.000	-123678	0.000
Aged 25 to 34	29914	0.216	89255	0.000
Speaks English not well or not at all	44635	0.009	-8083	0.621
Couple without children	277858	0.000	253774	0.000
Single parent with children	77699	0.000	26822	0.013
Other family type	100388	0.000	53062	0.001
Never married	-56243	0.000	-56196	0.000
Widowed/separated/divorced	29721	0.000	13597	0.084
Moved in the last 5 years	20490	0.083	-11681	0.342
Employed by the government	56294	0.004	-79827	0.000
Employed in agriculture	38792	0.003	-1100	0.933
Employed in mining	-69740	0.000	-26977	0.016
Employed in manufacturing	68538	0.000	91114	0.000
Employed in retail or hospitality	31427	0.220	-43792	0.076
CDEP scheme in the area	-3830	0.015	88	0.954
Proportion employed in CDEP scheme	46755	0.000	29281	0.000
Completed Year 12	n.a.	n.a.	-93071	0.000
Has qualifications (those completed Year 12)	n.a.	n.a.	225328	0.000
Has qualifications (those not completed Year 12)	n.a.	n.a.	-242383	0.000
Constant	33572	0.005	10440	0.392
Adjusted R-squared	0.1112		0.1834	
Effective sample size	22,478		22,478	

Table 6A.12 Factors associated with the income benefits of education for those employed in the SLA – Non-Indigenous males

	Specification 1		Specification 2	
	Coeffic.	P-value	Coeffic.	P-value
Victoria	-3712	0.000	-16454	0.000
Queensland	-4306	0.000	-5907	0.000
South Australia	-22642	0.000	-29786	0.000
Western Australia	-31355	0.000	-27805	0.000
Tasmania	-2147	0.000	-8553	0.000
Northern Territory	-33729	0.000	-36216	0.000
Australian Capital Territory	18374	0.000	13752	0.000
Inner regional	13702	0.000	14425	0.000
Outer regional	18339	0.000	17474	0.000
Remote	13777	0.000	14659	0.000
Very remote	5543	0.000	8456	0.000
Aged 15 to 24	-497254	0.000	-346802	0.000
Aged 25 to 34	-215006	0.000	-193294	0.000
Speaks English not well or not at all	-51724	0.000	-272326	0.000
Couple without children	103800	0.000	98469	0.000
Single parent with children	370367	0.000	129807	0.000
Other family type	69403	0.000	8231	0.016
Never married	29199	0.000	33398	0.000
Widowed/separated/divorced	-36319	0.000	-40054	0.000
Moved in the last 5 years	-135697	0.000	-179655	0.000
Employed by the government	-421530	0.000	-449071	0.000
Employed in agriculture	-174871	0.000	-144959	0.000
Employed in mining	-198943	0.000	-152954	0.000
Employed in manufacturing	206485	0.000	167140	0.000
Employed in retail or hospitality	-675910	0.000	-453060	0.000
CDEP scheme in the area	8049	0.000	5578	0.000
Proportion employed in CDEP scheme	-6540	0.000	-3590	0.000
Completed Year 12	n.a.	n.a.	-60193	0.000
Has qualifications (those completed Year 12)	n.a.	n.a.	143662	0.000
Has qualifications (those not completed Year 12)	n.a.	n.a.	-202513	0.000
Constant	232984	0.000	234804	0.000
Adjusted R-squared	0.6739		0.6977	
Effective sample size	652,178		652,178	

Appendix 7 Coefficient estimates and p-values for the factors associated with high school attendance

This Appendix gives the coefficient estimates and p-values for the factors associated with education attendance for 15-17 year olds. The results in Section 7A.1 and 7A.2 correspond to the results presented in Section 7.2 and 7.3 respectively.

Section 7A.1 Coefficient estimates and p-values for the individual, household and geographic factors associated with education participation

Table 7A.1 Coefficient estimates and p-values for the individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.712	0.000	-0.666	0.000
Aged 17	-1.239	0.000	-1.216	0.000
Speaks another language and English well	-0.071	0.296	-0.117	0.075
Speaks another language and English not well	-0.340	0.010	-0.526	0.000
Torres Strait Islander^{+}	0.049	0.370	0.134	0.019
Born overseas	-0.133	0.111	-0.029	0.737
Parents born overseas	0.051	0.394	0.080	0.197
Moved between 1996 and 2001	-0.087	0.012	-0.233	0.000
Victoria	0.049	0.461	0.161	0.023
Queensland	0.119	0.005	0.122	0.005
South Australia	0.166	0.017	0.167	0.017
Western Australia	-0.256	0.000	-0.209	0.000
Tasmania	-0.204	0.006	-0.285	0.000
Northern Territory	0.066	0.352	-0.020	0.777
Australian Capital Territory	0.315	0.055	0.357	0.030
Inner regional	-0.013	0.773	0.043	0.332
Outer regional	-0.008	0.865	0.011	0.821
Remote	-0.137	0.045	-0.043	0.560
Very remote	-0.220	0.000	-0.077	0.225
Single person household	-0.196	0.290	-0.014	0.945
Highest education in the household a degree	0.680	0.000	0.446	0.000
Highest education other qualification without Year 12	0.184	0.000	-0.005	0.915
Highest education other qualification with Year 12	0.513	0.000	0.267	0.000
Highest education Year 12 but no qualification	0.372	0.000	0.188	0.000
At least one adult with different Indigenous status	0.166	0.000	0.217	0.000
Extra person in the household	-0.009	0.417	0.010	0.321
Child under 15 in the household	0.238	0.000	0.246	0.000
Extra person per bedroom	-0.126	0.000	-0.163	0.000
Household owns or purchasing home	0.338	0.000	0.381	0.000
Equivalised income of others in the household	0.000	0.002	0.000	0.000
Constant	0.459	0.000	0.552	0.000
Pseudo R-squared	0.1849		0.1844	
Number of observations	8,220		8,123	

Table 7A.2 Coefficient estimates and p-values for the individual, household and geographic factors associated with the probability of attending high-school – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.731	0.000	-0.671	0.000
Aged 17	-1.255	0.000	-1.096	0.000
Speaks another language and English well	0.386	0.000	0.424	0.000
Speaks another language and English not well	-0.069	0.302	-0.531	0.000
Born overseas	0.075	0.000	0.054	0.000
Parents born overseas	0.055	0.000	0.026	0.002
Moved between 1996 and 2001	-0.172	0.000	-0.258	0.000
Victoria	0.204	0.000	0.320	0.000
Queensland	0.117	0.000	0.126	0.000
South Australia	0.123	0.000	0.153	0.000
Western Australia	-0.280	0.000	-0.282	0.000
Tasmania	-0.301	0.000	-0.443	0.000
Northern Territory	0.034	0.378	0.056	0.195
Australian Capital Territory	0.307	0.000	0.205	0.000
Inner regional	-0.013	0.074	-0.018	0.028
Outer regional	0.005	0.658	0.036	0.002
Remote	-0.070	0.009	0.066	0.041
Very remote	-0.323	0.000	-0.079	0.036
Single person household	-0.556	0.000	-0.735	0.000
Highest education in the household a degree	0.866	0.000	0.794	0.000
Highest education other qualification without Year 12	0.075	0.000	0.069	0.000
Highest education other qualification with Year 12	0.435	0.000	0.401	0.000
Highest education Year 12 but no qualification	0.393	0.000	0.356	0.000
At least one adult with different Indigenous status	-0.483	0.000	-0.630	0.000
Extra person in the household	-0.038	0.000	-0.003	0.446
Child under 15 in the household	0.301	0.000	0.282	0.000
Extra person per bedroom	-0.157	0.000	-0.226	0.000
Household owns or purchasing home	0.332	0.000	0.406	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Constant	1.043	0.000	1.119	0.000
Pseudo R-squared	0.1913		0.1984	
Number of observations	264,891		251,731	

Table 7A.3 Coefficient estimates and p-values for the individual, household and geographic factors associated with the probability of attending any education – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.578	0.000	-0.476	0.000
Aged 17	-1.033	0.000	-0.992	0.000
Speaks another language and English well	-0.046	0.492	-0.137	0.037
Speaks another language and English not well	-0.341	0.008	-0.559	0.000
Torres Strait Islander^{+}	0.016	0.783	0.140	0.019
Born overseas	-0.199	0.018	-0.012	0.893
Parents born overseas	0.084	0.178	0.127	0.053
Moved between 1996 and 2001	-0.004	0.920	-0.165	0.000
Victoria	0.042	0.540	0.150	0.046
Queensland	-0.005	0.915	-0.064	0.154
South Australia	0.093	0.190	0.157	0.031
Western Australia	-0.265	0.000	-0.238	0.000
Tasmania	0.181	0.023	0.193	0.018
Northern Territory	-0.030	0.672	-0.127	0.076
Australian Capital Territory	0.558	0.003	0.385	0.035
Inner regional	0.041	0.365	0.123	0.009
Outer regional	0.035	0.456	0.050	0.297
Remote	-0.243	0.000	-0.085	0.248
Very remote	-0.358	0.000	-0.252	0.000
Single person household	0.052	0.760	0.049	0.790
Highest education in the household a degree	0.685	0.000	0.469	0.000
Highest education other qualification without Year 12	0.217	0.000	0.058	0.227
Highest education other qualification with Year 12	0.543	0.000	0.269	0.000
Highest education Year 12 but no qualification	0.343	0.000	0.148	0.002
At least one adult with different Indigenous status	0.146	0.000	0.179	0.000
Extra person in the household	-0.019	0.070	-0.007	0.506
Child under 15 in the household	0.196	0.000	0.184	0.000
Extra person per bedroom	-0.111	0.000	-0.122	0.000
Household owns or purchasing home	0.348	0.000	0.330	0.000
Equivalised income of others in the household	0.000	0.036	0.000	0.000
Constant	0.733	0.000	0.828	0.000
Pseudo R-squared	0.1791		0.1758	
Number of observations	8,220		8,123	

Table 7A.4 Coefficient estimates and p-values for the individual, household and geographic factors associated with the probability of attending any education – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.592	0.000	-0.552	0.000
Aged 17	-1.055	0.000	-0.962	0.000
Speaks another language and English well	0.358	0.000	0.439	0.000
Speaks another language and English not well	0.033	0.657	-0.471	0.000
Born overseas	0.037	0.004	0.015	0.292
Parents born overseas	0.061	0.000	0.040	0.000
Moved between 1996 and 2001	-0.136	0.000	-0.217	0.000
Victoria	0.137	0.000	0.273	0.000
Queensland	-0.068	0.000	0.004	0.757
South Australia	-0.040	0.002	0.045	0.003
Western Australia	-0.287	0.000	-0.292	0.000
Tasmania	0.014	0.507	-0.035	0.119
Northern Territory	-0.034	0.418	-0.010	0.826
Australian Capital Territory	0.295	0.000	0.262	0.000
Inner regional	0.001	0.949	0.012	0.191
Outer regional	0.020	0.081	0.076	0.000
Remote	-0.141	0.000	0.015	0.667
Very remote	-0.369	0.000	-0.091	0.023
Single person household	-0.398	0.000	-0.623	0.000
Highest education in the household a degree	0.902	0.000	0.824	0.000
Highest education other qualification without Year 12	0.165	0.000	0.106	0.000
Highest education other qualification with Year 12	0.508	0.000	0.429	0.000
Highest education Year 12 but no qualification	0.392	0.000	0.351	0.000
At least one adult with different Indigenous status	-0.383	0.000	-0.504	0.000
Extra person in the household	-0.038	0.000	-0.008	0.064
Child under 15 in the household	0.274	0.000	0.238	0.000
Extra person per bedroom	-0.160	0.000	-0.225	0.000
Household owns or purchasing home	0.342	0.000	0.381	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Constant	1.256	0.000	1.390	0.000
Pseudo R-squared	0.1692		0.1754	
Number of observations	264,891		251,731	

Section 7A.2 Coefficient estimates and p-values for the area level factors associated with education participation

Table 7A.5 Coefficient estimates and p-values for the peer effects and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.715	0.000	-0.671	0.000
Aged 17	-1.244	0.000	-1.230	0.000
Speaks another language and English well	-0.069	0.309	-0.099	0.136
Speaks another language and English not well	-0.317	0.016	-0.496	0.000
Torres Strait Islander+	0.026	0.633	0.100	0.085
Born overseas	-0.142	0.089	-0.043	0.622
Parents born overseas	0.030	0.620	0.099	0.116
Moved between 1996 and 2001	-0.101	0.004	-0.252	0.000
Victoria	0.025	0.710	0.117	0.106
Queensland	0.072	0.098	0.086	0.059
South Australia	0.145	0.039	0.152	0.030
Western Australia	-0.217	0.000	-0.123	0.025
Tasmania	-0.184	0.016	-0.270	0.001
Northern Territory	0.080	0.264	0.054	0.450
Australian Capital Territory	0.199	0.239	0.258	0.120
Inner regional	-0.015	0.725	0.011	0.809
Outer regional	0.005	0.913	0.006	0.895
Remote	-0.105	0.130	0.031	0.676
Very remote	-0.111	0.093	0.051	0.445
Single person household	-0.207	0.264	-0.142	0.485
Highest education in the household a degree	0.661	0.000	0.432	0.000
Highest education other qualification without Year 12	0.169	0.000	-0.027	0.565
Highest education other qualification with Year 12	0.491	0.000	0.241	0.000
Highest education Year 12 but no qualification	0.358	0.000	0.167	0.000
At least one adult with different Indigenous status	0.153	0.000	0.197	0.000
Extra person in the household	-0.006	0.550	0.011	0.264
Child under 15 in the household	0.238	0.000	0.242	0.000
Extra person per bedroom	-0.121	0.000	-0.148	0.000
Household owns or purchasing home	0.324	0.000	0.365	0.000
Equivalised income of others in the household	0.000	0.003	0.000	0.000
High school peer effect	0.007	0.000	0.010	0.000
Other student peer effect	0.000	0.909	0.004	0.088
Constant	0.064	0.492	-0.092	0.355
Probability of the base case	0.707		0.795	
Pseudo R-squared	0.1892		0.1950	
Number of observations	8,169		8,079	

Table 7A.6 Coefficient estimates and p-values for the peer effects and individual, household and geographic factors associated with the probability of attending high-school – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.737	0.000	-0.677	0.000
Aged 17	-1.265	0.000	-1.104	0.000
Speaks another language and English well	0.366	0.000	0.399	0.000
Speaks another language and English not well	-0.099	0.137	-0.565	0.000
Born overseas	0.074	0.000	0.049	0.000
Parents born overseas	0.053	0.000	0.023	0.006
Moved between 1996 and 2001	-0.180	0.000	-0.265	0.000
Victoria	0.110	0.000	0.175	0.000
Queensland	0.098	0.000	0.122	0.000
South Australia	0.122	0.000	0.143	0.000
Western Australia	-0.140	0.000	-0.138	0.000
Tasmania	-0.047	0.036	-0.083	0.004
Northern Territory	0.010	0.798	0.085	0.051
Australian Capital Territory	0.145	0.000	0.092	0.002
Inner regional	0.048	0.000	0.031	0.000
Outer regional	0.089	0.000	0.090	0.000
Remote	0.106	0.000	0.116	0.000
Very remote	0.069	0.051	0.140	0.000
Single person household	-0.580	0.000	-0.767	0.000
Highest education in the household a degree	0.794	0.000	0.733	0.000
Highest education other qualification without Year 12	0.068	0.000	0.064	0.000
Highest education other qualification with Year 12	0.402	0.000	0.373	0.000
Highest education Year 12 but no qualification	0.364	0.000	0.330	0.000
At least one adult with different Indigenous status	-0.459	0.000	-0.609	0.000
Extra person in the household	-0.034	0.000	-0.001	0.765
Child under 15 in the household	0.297	0.000	0.278	0.000
Extra person per bedroom	-0.148	0.000	-0.217	0.000
Household owns or purchasing home	0.337	0.000	0.403	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
High school peer effect	0.024	0.000	0.027	0.000
Other student peer effect	0.000	0.843	0.002	0.369
Constant	-0.846	0.000	-1.142	0.000
Probability of the base case	0.857		0.908	
Pseudo R-squared	0.1990		0.2062	
Number of observations	264,889		251,731	

Table 7A.7 Coefficient estimates and p-values for the peer effects and individual, household and geographic factors associated with the probability of attending any education – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Male	Female
Aged 16	-0.580	0.000	-0.479	0.000
Aged 17	-1.034	0.000	-1.002	0.000
Speaks another language and English well	-0.040	0.554	-0.118	0.075
Speaks another language and English not well	-0.313	0.015	-0.526	0.000
Torres Strait Islander[+]	-0.004	0.939	0.100	0.097
Born overseas	-0.208	0.013	-0.025	0.781
Parents born overseas	0.065	0.302	0.145	0.029
Moved between 1996 and 2001	-0.018	0.621	-0.182	0.000
Victoria	0.024	0.734	0.105	0.169
Queensland	-0.035	0.436	-0.083	0.074
South Australia	0.081	0.256	0.143	0.050
Western Australia	-0.221	0.000	-0.151	0.007
Tasmania	0.157	0.056	0.177	0.041
Northern Territory	-0.001	0.985	-0.044	0.546
Australian Capital Territory	0.452	0.020	0.307	0.095
Inner regional	0.031	0.493	0.085	0.071
Outer regional	0.041	0.385	0.044	0.362
Remote	-0.195	0.005	-0.013	0.864
Very remote	-0.228	0.001	-0.120	0.071
Single person household	0.045	0.790	-0.045	0.812
Highest education in the household a degree	0.674	0.000	0.443	0.000
Highest education other qualification without Year 12	0.206	0.000	0.039	0.418
Highest education other qualification with Year 12	0.521	0.000	0.243	0.000
Highest education Year 12 but no qualification	0.332	0.000	0.128	0.008
At least one adult with different Indigenous status	0.131	0.000	0.158	0.000
Extra person in the household	-0.016	0.132	-0.005	0.651
Child under 15 in the household	0.193	0.000	0.173	0.000
Extra person per bedroom	-0.106	0.000	-0.109	0.000
Household owns or purchasing home	0.329	0.000	0.315	0.000
Equivalised income of others in the household	0.000	0.043	0.000	0.000
High school peer effect	0.008	0.000	0.010	0.000
Other student peer effect	0.004	0.057	0.006	0.011
Constant	0.273	0.004	0.185	0.069
Probability of the base case	0.782		0.852	
Pseudo R-squared	0.1834		0.1852	
Number of observations	8,169		8,079	

Table 7A.8 Coefficient estimates and p-values for the peer effects and individual, household and geographic factors associated with the probability of attending any education – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Male	Female
Aged 16	-0.597	0.000	-0.555	0.000
Aged 17	-1.063	0.000	-0.968	0.000
Speaks another language and English well	0.340	0.000	0.414	0.000
Speaks another language and English not well	0.010	0.898	-0.506	0.000
Born overseas	0.036	0.005	0.011	0.434
Parents born overseas	0.060	0.000	0.038	0.000
Moved between 1996 and 2001	-0.143	0.000	-0.223	0.000
Victoria	0.066	0.000	0.146	0.000
Queensland	-0.018	0.131	0.034	0.007
South Australia	0.019	0.198	0.067	0.000
Western Australia	-0.147	0.000	-0.152	0.000
Tasmania	0.124	0.000	0.150	0.000
Northern Territory	-0.015	0.722	0.039	0.416
Australian Capital Territory	0.144	0.000	0.138	0.000
Inner regional	0.048	0.000	0.049	0.000
Outer regional	0.083	0.000	0.109	0.000
Remote	0.051	0.078	0.076	0.028
Very remote	0.054	0.139	0.118	0.004
Single person household	-0.417	0.000	-0.651	0.000
Highest education in the household a degree	0.833	0.000	0.765	0.000
Highest education other qualification without Year 12	0.157	0.000	0.101	0.000
Highest education other qualification with Year 12	0.475	0.000	0.402	0.000
Highest education Year 12 but no qualification	0.364	0.000	0.327	0.000
At least one adult with different Indigenous status	-0.357	0.000	-0.483	0.000
Extra person in the household	-0.034	0.000	-0.005	0.217
Child under 15 in the household	0.269	0.000	0.235	0.000
Extra person per bedroom	-0.152	0.000	-0.219	0.000
Household owns or purchasing home	0.345	0.000	0.377	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
High school peer effect	0.027	0.000	0.030	0.000
Other student peer effect	0.020	0.000	0.021	0.000
Constant	-1.034	0.000	-1.215	0.000
Probability of the base case	0.900		0.942	
Pseudo R-squared	0.1768		0.1826	
Number of observations	264,889		521,731	

Table 7A.9 Coefficient estimates and p-values for the role model effects and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.715	0.000	-0.663	0.000
Aged 17	-1.245	0.000	-1.220	0.000
Speaks another language and English well	-0.080	0.243	-0.095	0.151
Speaks another language and English not well	-0.337	0.010	-0.486	0.001
Torres Strait Islander[+]	0.007	0.894	0.085	0.141
Born overseas	-0.152	0.070	-0.026	0.766
Parents born overseas	0.036	0.554	0.066	0.290
Moved between 1996 and 2001	-0.107	0.002	-0.257	0.000
Victoria	0.043	0.532	0.149	0.038
Queensland	0.034	0.467	0.046	0.343
South Australia	0.207	0.003	0.210	0.003
Western Australia	-0.237	0.000	-0.176	0.002
Tasmania	-0.235	0.002	-0.284	0.000
Northern Territory	0.118	0.102	0.036	0.617
Australian Capital Territory	0.055	0.751	0.183	0.289
Inner regional	0.033	0.470	0.111	0.015
Outer regional	0.109	0.025	0.125	0.011
Remote	0.053	0.471	0.131	0.091
Very remote	0.013	0.851	0.128	0.067
Single person household	-0.202	0.275	-0.068	0.729
Highest education in the household a degree	0.616	0.000	0.403	0.000
Highest education other qualification without Year 12	0.168	0.000	-0.022	0.640
Highest education other qualification with Year 12	0.478	0.000	0.221	0.000
Highest education Year 12 but no qualification	0.349	0.000	0.167	0.000
At least one adult with different Indigenous status	0.146	0.000	0.205	0.000
Extra person in the household	-0.004	0.742	0.017	0.101
Child under 15 in the household	0.232	0.000	0.238	0.000
Extra person per bedroom	-0.126	0.000	-0.163	0.000
Household owns or purchasing home	0.337	0.000	0.377	0.000
Equivalised income of others in the household	0.000	0.010	0.000	0.000
Percent aged 18 to 29 completed Year	0.006	0.000	0.007	0.000
Percent aged 30 plus completed Year 12	0.001	0.565	0.002	0.453
Percent aged 18 to 29 with qualifications	-0.004	0.020	0.003	0.184
Percent aged 30 plus with qualifications	0.009	0.000	0.003	0.232
Constant	0.068	0.436	0.121	0.172
Probability of the base case	0.689		0.768	
Pseudo R-squared	0.1904		0.1893	
Number of observations	8,209		8,119	

Table 7A.10 Coefficient estimates and p-values for the role model effects and individual, household and geographic factors associated with the probability of attending high-school – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.735	0.000	-0.675	0.000
Aged 17	-1.263	0.000	-1.103	0.000
Speaks another language and English well	0.366	0.000	0.405	0.000
Speaks another language and English not well	-0.099	0.138	-0.565	0.000
Born overseas	0.074	0.000	0.050	0.000
Parents born overseas	0.047	0.000	0.019	0.025
Moved between 1996 and 2001	-0.181	0.000	-0.271	0.000
Victoria	0.234	0.000	0.292	0.000
Queensland	0.090	0.000	0.096	0.000
South Australia	0.187	0.000	0.191	0.000
Western Australia	-0.276	0.000	-0.274	0.000
Tasmania	-0.252	0.000	-0.341	0.000
Northern Territory	-0.077	0.052	-0.047	0.290
Australian Capital Territory	0.122	0.000	0.034	0.271
Inner regional	0.114	0.000	0.085	0.000
Outer regional	0.211	0.000	0.195	0.000
Remote	0.135	0.000	0.183	0.000
Very remote	-0.132	0.000	0.012	0.751
Single person household	-0.589	0.000	-0.776	0.000
Highest education in the household a degree	0.791	0.000	0.721	0.000
Highest education other qualification without Year 12	0.070	0.000	0.064	0.000
Highest education other qualification with Year 12	0.401	0.000	0.369	0.000
Highest education Year 12 but no qualification	0.363	0.000	0.326	0.000
At least one adult with different Indigenous status	-0.472	0.000	-0.617	0.000
Extra person in the household	-0.034	0.000	0.003	0.508
Child under 15 in the household	0.298	0.000	0.280	0.000
Extra person per bedroom	-0.151	0.000	-0.225	0.000
Household owns or purchasing home	0.343	0.000	0.413	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Percent aged 18 to 29 completed Year	0.008	0.000	0.010	0.000
Percent aged 30 plus completed Year 12	0.003	0.002	0.003	0.049
Percent aged 18 to 29 with qualifications	-0.001	0.093	-0.002	0.128
Percent aged 30 plus with qualifications	0.003	0.000	0.002	0.088
Constant	0.344	0.000	0.345	0.000
Probability of the base case	0.845		0.902	
Pseudo R-squared	0.1969		0.2039	
Number of observations	264,891		251,731	

Table 7A.11 Coefficient estimates and p-values for the role model effects and individual, household and geographic factors associated with the probability of attending any education – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.579	0.000	-0.473	0.000
Aged 17	-1.036	0.000	-0.994	0.000
Speaks another language and English well	-0.040	0.551	-0.119	0.070
Speaks another language and English not well	-0.317	0.014	-0.526	0.000
Torres Strait Islander+	-0.024	0.670	0.095	0.117
Born overseas	-0.220	0.009	-0.010	0.913
Parents born overseas	0.069	0.271	0.119	0.072
Moved between 1996 and 2001	-0.027	0.452	-0.185	0.000
Victoria	0.006	0.927	0.124	0.105
Queensland	-0.060	0.213	-0.147	0.003
South Australia	0.121	0.092	0.191	0.010
Western Australia	-0.239	0.000	-0.221	0.000
Tasmania	0.113	0.162	0.184	0.026
Northern Territory	0.022	0.757	-0.078	0.288
Australian Capital Territory	0.327	0.101	0.197	0.300
Inner regional	0.078	0.093	0.191	0.000
Outer regional	0.162	0.001	0.154	0.002
Remote	-0.025	0.740	0.071	0.363
Very remote	-0.092	0.198	-0.072	0.307
Single person household	0.030	0.861	0.003	0.989
Highest education in the household a degree	0.626	0.000	0.435	0.000
Highest education other qualification without Year 12	0.198	0.000	0.043	0.367
Highest education other qualification with Year 12	0.504	0.000	0.227	0.000
Highest education Year 12 but no qualification	0.323	0.000	0.126	0.009
At least one adult with different Indigenous status	0.119	0.001	0.168	0.000
Extra person in the household	-0.013	0.229	-0.001	0.934
Child under 15 in the household	0.187	0.000	0.177	0.000
Extra person per bedroom	-0.112	0.000	-0.122	0.000
Household owns or purchasing home	0.343	0.000	0.327	0.000
Equivalised income of others in the household	0.000	0.132	0.000	0.000
Percent aged 18 to 29 completed Year	0.004	0.008	0.006	0.000
Percent aged 30 plus completed Year 12	0.001	0.666	0.005	0.113
Percent aged 18 to 29 with qualifications	0.001	0.616	0.004	0.052
Percent aged 30 plus with qualifications	0.011	0.000	-0.001	0.859
Constant	0.277	0.002	0.451	0.000
Probability of the base case	0.752		0.828	
Pseudo R-squared	0.1847		0.1801	
Number of observations	8,209		8,119	

Table 7A.12 Coefficient estimates and p-values for the role model effects and individual, household and geographic factors associated with the probability of attending any education – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.596	0.000	-0.555	0.000
Aged 17	-1.061	0.000	-0.968	0.000
Speaks another language and English well	0.350	0.000	0.436	0.000
Speaks another language and English not well	0.016	0.832	-0.492	0.000
Born overseas	0.035	0.006	0.012	0.403
Parents born overseas	0.054	0.000	0.036	0.000
Moved between 1996 and 2001	-0.147	0.000	-0.231	0.000
Victoria	0.166	0.000	0.267	0.000
Queensland	-0.071	0.000	0.013	0.409
South Australia	0.040	0.004	0.103	0.000
Western Australia	-0.280	0.000	-0.266	0.000
Tasmania	0.081	0.000	0.075	0.002
Northern Territory	-0.156	0.000	-0.112	0.021
Australian Capital Territory	0.132	0.000	0.095	0.010
Inner regional	0.105	0.000	0.083	0.000
Outer regional	0.201	0.000	0.196	0.000
Remote	0.039	0.184	0.113	0.001
Very remote	-0.225	0.000	-0.025	0.540
Single person household	-0.426	0.000	-0.661	0.000
Highest education in the household a degree	0.827	0.000	0.748	0.000
Highest education other qualification without Year 12	0.157	0.000	0.099	0.000
Highest education other qualification with Year 12	0.472	0.000	0.395	0.000
Highest education Year 12 but no qualification	0.362	0.000	0.322	0.000
At least one adult with different Indigenous status	-0.375	0.000	-0.490	0.000
Extra person in the household	-0.033	0.000	-0.002	0.711
Child under 15 in the household	0.270	0.000	0.236	0.000
Extra person per bedroom	-0.154	0.000	-0.224	0.000
Household owns or purchasing home	0.351	0.000	0.387	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Percent aged 18 to 29 completed Year	0.007	0.000	0.008	0.000
Percent aged 30 plus completed Year 12	0.001	0.167	-0.002	0.306
Percent aged 18 to 29 with qualifications	0.002	0.013	-0.001	0.544
Percent aged 30 plus with qualifications	0.005	0.000	0.008	0.000
Constant	0.445	0.000	0.657	0.000
Probability of the base case	0.889		0.933	
Pseudo R-squared	0.1750		0.1810	
Number of observations	264,891		251,731	

Table 7A.13 Coefficient estimates and p-values for the employment benefits and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.711	0.000	-0.670	0.000
Aged 17	-1.238	0.000	-1.221	0.000
Speaks another language and English well	-0.066	0.331	-0.113	0.085
Speaks another language and English not well	-0.330	0.012	-0.501	0.000
Torres Strait Islander^{+}	0.045	0.414	0.127	0.027
Born overseas	-0.134	0.109	-0.027	0.760
Parents born overseas	0.051	0.400	0.078	0.208
Moved between 1996 and 2001	-0.088	0.012	-0.238	0.000
Victoria	0.037	0.585	0.144	0.043
Queensland	0.114	0.008	0.136	0.002
South Australia	0.166	0.017	0.177	0.012
Western Australia	-0.260	0.000	-0.207	0.000
Tasmania	-0.221	0.003	-0.294	0.000
Northern Territory	0.078	0.275	-0.005	0.945
Australian Capital Territory	0.292	0.077	0.297	0.073
Inner regional	-0.008	0.850	0.066	0.142
Outer regional	0.000	0.994	0.046	0.334
Remote	-0.132	0.055	-0.029	0.694
Very remote	-0.227	0.000	-0.055	0.396
Single person household	-0.199	0.283	-0.030	0.878
Highest education in the household a degree	0.676	0.000	0.438	0.000
Highest education other qualification without Year 12	0.182	0.000	-0.008	0.868
Highest education other qualification with Year 12	0.510	0.000	0.258	0.000
Highest education Year 12 but no qualification	0.369	0.000	0.183	0.000
At least one adult with different Indigenous status	0.163	0.000	0.215	0.000
Extra person in the household	-0.008	0.436	0.011	0.277
Child under 15 in the household	0.236	0.000	0.245	0.000
Extra person per bedroom	-0.125	0.000	-0.161	0.000
Household owns or purchasing home	0.336	0.000	0.380	0.000
Equivalised income of others in the household	0.000	0.003	0.000	0.000
Employment if not completed high school	0.006	0.228	0.013	0.005
Employment benefit of high school	0.002	0.719	0.015	0.000
Constant	0.336	0.012	0.220	0.049
Probability of the base case	0.707		0.782	
Pseudo R-squared	0.1850		0.1857	
Number of observations	8,220		8,123	

Table 7A.14 Coefficient estimates and p-values for the employment benefits and individual, household and geographic factors associated with the probability of attending high-school – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.733	0.000	-0.673	0.000
Aged 17	-1.257	0.000	-1.098	0.000
Speaks another language and English well	0.397	0.000	0.445	0.000
Speaks another language and English not well	-0.065	0.330	-0.519	0.000
Born overseas	0.077	0.000	0.053	0.000
Parents born overseas	0.060	0.000	0.029	0.000
Moved between 1996 and 2001	-0.175	0.000	-0.263	0.000
Victoria	0.192	0.000	0.304	0.000
Queensland	0.140	0.000	0.142	0.000
South Australia	0.128	0.000	0.155	0.000
Western Australia	-0.266	0.000	-0.281	0.000
Tasmania	-0.263	0.000	-0.412	0.000
Northern Territory	-0.004	0.917	-0.023	0.599
Australian Capital Territory	0.235	0.000	0.132	0.000
Inner regional	-0.026	0.000	-0.022	0.008
Outer regional	-0.007	0.503	0.040	0.001
Remote	-0.087	0.001	0.040	0.217
Very remote	-0.358	0.000	-0.137	0.000
Single person household	-0.567	0.000	-0.743	0.000
Highest education in the household a degree	0.852	0.000	0.778	0.000
Highest education other qualification without Year 12	0.073	0.000	0.066	0.000
Highest education other qualification with Year 12	0.428	0.000	0.391	0.000
Highest education Year 12 but no qualification	0.388	0.000	0.349	0.000
At least one adult with different Indigenous status	-0.483	0.000	-0.628	0.000
Extra person in the household	-0.037	0.000	-0.002	0.536
Child under 15 in the household	0.300	0.000	0.281	0.000
Extra person per bedroom	-0.155	0.000	-0.220	0.000
Household owns or purchasing home	0.333	0.000	0.404	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Employment if not completed high school	0.048	0.000	0.030	0.000
Employment benefit of high school	0.068	0.000	0.026	0.000
Constant	-0.588	0.000	0.306	0.000
Probability of the base case	0.855		0.903	
Pseudo R-squared	0.1922		0.1996	
Number of observations	264,891		251,731	

Table 7A.15 Coefficient estimates and p-values for the employment benefits and individual, household and geographic factors associated with the probability of attending any education – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.578	0.000	-0.478	0.000
Aged 17	-1.032	0.000	-0.995	0.000
Speaks another language and English well	-0.042	0.528	-0.135	0.039
Speaks another language and English not well	-0.332	0.010	-0.544	0.000
Torres Strait Islander+	0.012	0.827	0.137	0.023
Born overseas	-0.200	0.017	-0.011	0.907
Parents born overseas	0.084	0.179	0.126	0.055
Moved between 1996 and 2001	-0.004	0.901	-0.168	0.000
Victoria	0.034	0.631	0.140	0.064
Queensland	-0.006	0.899	-0.052	0.250
South Australia	0.093	0.189	0.163	0.025
Western Australia	-0.267	0.000	-0.235	0.000
Tasmania	0.172	0.035	0.196	0.018
Northern Territory	-0.021	0.772	-0.122	0.093
Australian Capital Territory	0.538	0.005	0.346	0.059
Inner regional	0.045	0.319	0.137	0.004
Outer regional	0.043	0.366	0.073	0.133
Remote	-0.238	0.001	-0.078	0.289
Very remote	-0.360	0.000	-0.232	0.000
Single person household	0.050	0.771	0.038	0.836
Highest education in the household a degree	0.682	0.000	0.464	0.000
Highest education other qualification without Year 12	0.215	0.000	0.057	0.238
Highest education other qualification with Year 12	0.541	0.000	0.264	0.000
Highest education Year 12 but no qualification	0.341	0.000	0.146	0.003
At least one adult with different Indigenous status	0.144	0.000	0.178	0.000
Extra person in the household	-0.019	0.075	-0.006	0.537
Child under 15 in the household	0.195	0.000	0.184	0.000
Extra person per bedroom	-0.111	0.000	-0.121	0.000
Household owns or purchasing home	0.347	0.000	0.331	0.000
Equivalised income of others in the household	0.000	0.045	0.000	0.000
Employment if not completed high school	0.005	0.301	0.007	0.131
Employment benefit of high school	0.003	0.493	0.011	0.012
Constant	0.610	0.000	0.617	0.000
Probability of the base case	0.771		0.837	
Pseudo R-squared	0.1792		0.1765	
Number of observations	8,220		8,123	

Table 7A.16 Coefficient estimates and p-values for the employment benefits and individual, household and geographic factors associated with the probability of attending any education – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.594	0.000	-0.553	0.000
Aged 17	-1.057	0.000	-0.964	0.000
Speaks another language and English well	0.372	0.000	0.459	0.000
Speaks another language and English not well	0.040	0.598	-0.459	0.000
Born overseas	0.039	0.002	0.015	0.317
Parents born overseas	0.067	0.000	0.043	0.000
Moved between 1996 and 2001	-0.140	0.000	-0.221	0.000
Victoria	0.122	0.000	0.257	0.000
Queensland	-0.042	0.000	0.021	0.066
South Australia	-0.034	0.010	0.048	0.001
Western Australia	-0.272	0.000	-0.289	0.000
Tasmania	0.060	0.005	0.001	0.969
Northern Territory	-0.080	0.061	-0.087	0.071
Australian Capital Territory	0.213	0.000	0.184	0.000
Inner regional	-0.014	0.089	0.006	0.512
Outer regional	0.006	0.599	0.075	0.000
Remote	-0.162	0.000	-0.012	0.722
Very remote	-0.412	0.000	-0.149	0.000
Single person household	-0.410	0.000	-0.632	0.000
Highest education in the household a degree	0.886	0.000	0.807	0.000
Highest education other qualification without Year 12	0.163	0.000	0.103	0.000
Highest education other qualification with Year 12	0.500	0.000	0.419	0.000
Highest education Year 12 but no qualification	0.386	0.000	0.344	0.000
At least one adult with different Indigenous status	-0.383	0.000	-0.502	0.000
Extra person in the household	-0.036	0.000	-0.007	0.104
Child under 15 in the household	0.273	0.000	0.238	0.000
Extra person per bedroom	-0.158	0.000	-0.221	0.000
Household owns or purchasing home	0.342	0.000	0.379	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Employment if not completed high school	0.054	0.000	0.031	0.000
Employment benefit of high school	0.074	0.000	0.030	0.000
Constant	-0.574	0.000	0.521	0.000
Probability of the base case	0.897		0.934	
Pseudo R-squared	0.1705		0.1767	
Number of observations	264,891		251,731	

Table 7A.17 Coefficient estimates and p-values for the income benefits and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.711	0.000	-0.668	0.000
Aged 17	-1.239	0.000	-1.218	0.000
Speaks another language and English well	-0.049	0.039	-0.058	0.385
Speaks another language and English not well	-0.307	0.000	-0.447	0.002
Torres Strait Islander[+]	0.045	0.023	0.118	0.041
Born overseas	-0.136	0.907	-0.046	0.598
Parents born overseas	0.047	0.055	0.068	0.276
Moved between 1996 and 2001	-0.096	0.000	-0.252	0.000
Victoria	0.050	0.064	0.169	0.017
Queensland	0.124	0.250	0.149	0.001
South Australia	0.168	0.025	0.188	0.007
Western Australia	-0.264	0.000	-0.228	0.000
Tasmania	-0.206	0.018	-0.280	0.000
Northern Territory	0.068	0.093	-0.014	0.843
Australian Capital Territory	0.268	0.059	0.246	0.141
Inner regional	0.008	0.004	0.098	0.032
Outer regional	0.030	0.133	0.107	0.030
Remote	-0.090	0.289	0.080	0.294
Very remote	-0.137	0.000	0.127	0.077
Single person household	-0.199	0.836	-0.038	0.844
Highest education in the household a degree	0.676	0.000	0.443	0.000
Highest education other qualification without Year 12	0.184	0.238	-0.014	0.756
Highest education other qualification with Year 12	0.510	0.000	0.255	0.000
Highest education Year 12 but no qualification	0.369	0.003	0.187	0.000
At least one adult with different Indigenous status	0.160	0.000	0.207	0.000
Extra person in the household	-0.007	0.537	0.016	0.121
Child under 15 in the household	0.233	0.000	0.234	0.000
Extra person per bedroom	-0.124	0.000	-0.159	0.000
Household owns or purchasing home	0.335	0.000	0.378	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Income if not completed high school	4.34E-07	0.131	1.13E-06	0.000
Income benefit of high school	-1.43E-07	0.012	3.58E-08	0.858
Constant	0.226	0.000	-0.014	0.908
Probability of the base case	0.695		0.760	
Pseudo R-squared	0.1856		0.1878	
Number of observations	8,220		8,123	

Table 7A.18 Coefficient estimates and p-values for the income benefits and individual, household and geographic factors associated with the probability of attending high-school – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.735	0.000	-0.673	0.000
Aged 17	-1.260	0.000	-1.099	0.000
Speaks another language and English well	0.397	0.000	0.433	0.000
Speaks another language and English not well	-0.075	0.260	-0.536	0.000
Born overseas	0.079	0.000	0.054	0.000
Parents born overseas	0.060	0.000	0.029	0.000
Moved between 1996 and 2001	-0.178	0.000	-0.264	0.000
Victoria	0.242	0.000	0.347	0.000
Queensland	0.180	0.000	0.172	0.000
South Australia	0.231	0.000	0.234	0.000
Western Australia	-0.170	0.000	-0.197	0.000
Tasmania	-0.270	0.000	-0.423	0.000
Northern Territory	0.045	0.248	0.068	0.118
Australian Capital Territory	0.185	0.000	0.105	0.000
Inner regional	-0.017	0.031	-0.024	0.007
Outer regional	0.024	0.029	0.047	0.000
Remote	-0.037	0.172	0.089	0.006
Very remote	-0.300	0.000	-0.061	0.109
Single person household	-0.582	0.000	-0.757	0.000
Highest education in the household a degree	0.819	0.000	0.757	0.000
Highest education other qualification without Year 12	0.073	0.000	0.067	0.000
Highest education other qualification with Year 12	0.419	0.000	0.388	0.000
Highest education Year 12 but no qualification	0.379	0.000	0.345	0.000
At least one adult with different Indigenous status	-0.484	0.000	-0.629	0.000
Extra person in the household	-0.034	0.000	0.002	0.635
Child under 15 in the household	0.299	0.000	0.281	0.000
Extra person per bedroom	-0.156	0.000	-0.229	0.000
Household owns or purchasing home	0.341	0.000	0.413	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Income if not completed high school	6.26E-07	0.000	4.36E-07	0.000
Income benefit of high school	2.51E-06	0.000	1.95E-06	0.000
Constant	0.361	0.000	0.748	0.000
Probability of the base case	0.848		0.899	
Pseudo R-squared	0.1948		0.2005	
Number of observations	264,891		251,731	

Table 7A.19 Coefficient estimates and p-values for the income benefits and individual, household and geographic factors associated with the probability of attending any education – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.578	0.000	-0.477	0.000
Aged 17	-1.034	0.000	-0.993	0.000
Speaks another language and English well	0.000	0.998	-0.081	0.228
Speaks another language and English not well	-0.274	0.035	-0.483	0.001
Torres Strait Islander+	0.006	0.918	0.125	0.038
Born overseas	-0.208	0.013	-0.029	0.752
Parents born overseas	0.076	0.223	0.115	0.080
Moved between 1996 and 2001	-0.019	0.601	-0.184	0.000
Victoria	0.049	0.476	0.156	0.038
Queensland	0.011	0.797	-0.038	0.402
South Australia	0.103	0.147	0.176	0.016
Western Australia	-0.280	0.000	-0.256	0.000
Tasmania	0.182	0.022	0.199	0.015
Northern Territory	-0.021	0.766	-0.118	0.101
Australian Capital Territory	0.459	0.016	0.278	0.132
Inner regional	0.079	0.084	0.175	0.000
Outer regional	0.104	0.033	0.142	0.005
Remote	-0.159	0.025	0.029	0.707
Very remote	-0.212	0.002	-0.060	0.404
Single person household	0.051	0.766	0.024	0.896
Highest education in the household a degree	0.680	0.000	0.467	0.000
Highest education other qualification without Year 12	0.215	0.000	0.048	0.317
Highest education other qualification with Year 12	0.537	0.000	0.259	0.000
Highest education Year 12 but no qualification	0.339	0.000	0.146	0.002
At least one adult with different Indigenous status	0.135	0.000	0.169	0.000
Extra person in the household	-0.015	0.154	-0.001	0.921
Child under 15 in the household	0.186	0.000	0.171	0.000
Extra person per bedroom	-0.109	0.000	-0.119	0.000
Household owns or purchasing home	0.343	0.000	0.327	0.000
Equivalised income of others in the household	0.000	0.132	0.000	0.000
Income if not completed high school	8.59E-07	0.000	1.09E-06	0.000
Income benefit of high school	2.75E-08	0.894	5.60E-08	0.784
Constant	0.248	0.063	0.285	0.020
Probability of the base case	0.751		0.819	
Pseudo R-squared	0.1811		0.1790	
Number of observations	8,220		8,123	

Table 7A.20 Coefficient estimates and p-values for the income benefits and individual, household and geographic factors associated with the probability of attending any education – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.595	0.000	-0.553	0.000
Aged 17	-1.060	0.000	-0.965	0.000
Speaks another language and English well	0.369	0.000	0.448	0.000
Speaks another language and English not well	0.030	0.689	-0.477	0.000
Born overseas	0.040	0.002	0.016	0.282
Parents born overseas	0.065	0.000	0.044	0.000
Moved between 1996 and 2001	-0.142	0.000	-0.223	0.000
Victoria	0.177	0.000	0.301	0.000
Queensland	0.000	0.988	0.052	0.000
South Australia	0.075	0.000	0.133	0.000
Western Australia	-0.179	0.000	-0.196	0.000
Tasmania	0.051	0.016	-0.016	0.490
Northern Territory	-0.041	0.334	0.007	0.885
Australian Capital Territory	0.164	0.000	0.146	0.000
Inner regional	0.001	0.940	0.002	0.853
Outer regional	0.049	0.000	0.081	0.000
Remote	-0.109	0.000	0.040	0.247
Very remote	-0.365	0.000	-0.069	0.088
Single person household	-0.424	0.000	-0.647	0.000
Highest education in the household a degree	0.853	0.000	0.782	0.000
Highest education other qualification without Year 12	0.163	0.000	0.104	0.000
Highest education other qualification with Year 12	0.490	0.000	0.415	0.000
Highest education Year 12 but no qualification	0.377	0.000	0.339	0.000
At least one adult with different Indigenous status	-0.385	0.000	-0.502	0.000
Extra person in the household	-0.033	0.000	-0.002	0.599
Child under 15 in the household	0.271	0.000	0.238	0.000
Extra person per bedroom	-0.159	0.000	-0.230	0.000
Household owns or purchasing home	0.351	0.000	0.388	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Income if not completed high school	7.85E-07	0.000	4.61E-07	0.000
Income benefit of high school	2.46E-06	0.000	2.24E-06	0.000
Constant	0.478	0.000	0.985	0.000
Probability of the base case	0.891		0.932	
Pseudo R-squared	0.1732		0.1781	
Number of observations	264,891		251,731	

Table 7A.21 Coefficient estimates and p-values for the CDEP scheme and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.712	0.000	-0.667	0.000
Aged 17	-1.238	0.000	-1.216	0.000
Speaks another language and English well	-0.074	0.281	-0.118	0.074
Speaks another language and English not well	-0.340	0.010	-0.527	0.000
Torres Strait Islander[+]	0.048	0.382	0.129	0.024
Born overseas	-0.133	0.110	-0.038	0.665
Parents born overseas	0.046	0.447	0.080	0.198
Moved between 1996 and 2001	-0.090	0.010	-0.239	0.000
Victoria	0.024	0.722	0.134	0.060
Queensland	0.101	0.018	0.102	0.021
South Australia	0.162	0.021	0.159	0.024
Western Australia	-0.271	0.000	-0.225	0.000
Tasmania	-0.251	0.001	-0.338	0.000
Northern Territory	0.047	0.509	-0.039	0.582
Australian Capital Territory	0.300	0.067	0.330	0.046
Inner regional	0.016	0.723	0.076	0.098
Outer regional	0.035	0.465	0.058	0.232
Remote	-0.057	0.431	0.045	0.568
Very remote	-0.123	0.079	0.023	0.743
Single person household	-0.206	0.266	-0.027	0.891
Highest education in the household a degree	0.681	0.000	0.450	0.000
Highest education other qualification without Year 12	0.182	0.000	-0.005	0.916
Highest education other qualification with Year 12	0.514	0.000	0.270	0.000
Highest education Year 12 but no qualification	0.372	0.000	0.192	0.000
At least one adult with different Indigenous status	0.159	0.000	0.208	0.000
Extra person in the household	-0.009	0.408	0.011	0.295
Child under 15 in the household	0.239	0.000	0.246	0.000
Extra person per bedroom	-0.124	0.000	-0.163	0.000
Household owns or purchasing home	0.332	0.000	0.374	0.000
Equivalised income of others in the household	0.000	0.002	0.000	0.000
Presence of the CDEP scheme in the area	-0.107	0.013	-0.121	0.006
Percent of ERP employed in the CDEP scheme	-0.001	0.617	0.000	0.801
Constant	0.494	0.000	0.591	0.000
Probability of the base case	0.716		0.799	
Pseudo R-squared	0.1857		0.1854	
Number of observations	8,220		8,123	

Table 7A.22 Coefficient estimates and p-values for the CDEP scheme and individual, household and geographic factors associated with the probability of attending high-school – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.732	0.000	-0.671	0.000
Aged 17	-1.255	0.000	-1.096	0.000
Speaks another language and English well	0.386	0.000	0.422	0.000
Speaks another language and English not well	-0.068	0.306	-0.531	0.000
Born overseas	0.075	0.000	0.054	0.000
Parents born overseas	0.055	0.000	0.026	0.002
Moved between 1996 and 2001	-0.172	0.000	-0.259	0.000
Victoria	0.203	0.000	0.307	0.000
Queensland	0.117	0.000	0.118	0.000
South Australia	0.122	0.000	0.145	0.000
Western Australia	-0.286	0.000	-0.294	0.000
Tasmania	-0.297	0.000	-0.449	0.000
Northern Territory	0.020	0.606	0.026	0.555
Australian Capital Territory	0.303	0.000	0.191	0.000
Inner regional	-0.016	0.035	-0.010	0.257
Outer regional	-0.004	0.725	0.044	0.000
Remote	-0.085	0.002	0.079	0.016
Very remote	-0.347	0.000	-0.074	0.057
Single person household	-0.556	0.000	-0.735	0.000
Highest education in the household a degree	0.866	0.000	0.793	0.000
Highest education other qualification without Year 12	0.075	0.000	0.069	0.000
Highest education other qualification with Year 12	0.435	0.000	0.400	0.000
Highest education Year 12 but no qualification	0.393	0.000	0.355	0.000
At least one adult with different Indigenous status	-0.483	0.000	-0.630	0.000
Extra person in the household	-0.038	0.000	-0.003	0.427
Child under 15 in the household	0.301	0.000	0.282	0.000
Extra person per bedroom	-0.157	0.000	-0.226	0.000
Household owns or purchasing home	0.333	0.000	0.406	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Presence of the CDEP scheme in the area	-0.001	0.937	-0.064	0.000
Percent of ERP employed in the CDEP scheme	0.001	0.002	0.002	0.000
Constant	1.042	0.000	1.130	0.000
Probability of the base case	0.853		0.903	
Pseudo R-squared	0.1914		0.1986	
Number of observations	264,891		251,731	

Table 7A.23 Coefficient estimates and p-values for the CDEP scheme and individual, household and geographic factors associated with the probability of attending any education – Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.578	0.000	-0.477	0.000
Aged 17	-1.031	0.000	-0.992	0.000
Speaks another language and English well	-0.052	0.444	-0.133	0.044
Speaks another language and English not well	-0.343	0.008	-0.554	0.000
Torres Strait Islander+	0.014	0.805	0.137	0.023
Born overseas	-0.200	0.017	-0.021	0.822
Parents born overseas	0.078	0.214	0.128	0.052
Moved between 1996 and 2001	-0.007	0.834	-0.171	0.000
Victoria	0.015	0.836	0.120	0.115
Queensland	-0.025	0.568	-0.085	0.061
South Australia	0.090	0.210	0.145	0.048
Western Australia	-0.281	0.000	-0.263	0.000
Tasmania	0.122	0.131	0.143	0.086
Northern Territory	-0.050	0.484	-0.151	0.038
Australian Capital Territory	0.545	0.004	0.353	0.054
Inner regional	0.076	0.099	0.153	0.001
Outer regional	0.089	0.067	0.093	0.065
Remote	-0.142	0.053	-0.009	0.913
Very remote	-0.235	0.001	-0.166	0.020
Single person household	0.040	0.815	0.035	0.848
Highest education in the household a degree	0.687	0.000	0.471	0.000
Highest education other qualification without Year 12	0.215	0.000	0.058	0.226
Highest education other qualification with Year 12	0.544	0.000	0.271	0.000
Highest education Year 12 but no qualification	0.344	0.000	0.150	0.002
At least one adult with different Indigenous status	0.137	0.000	0.171	0.000
Extra person in the household	-0.019	0.068	-0.006	0.553
Child under 15 in the household	0.198	0.000	0.185	0.000
Extra person per bedroom	-0.109	0.000	-0.123	0.000
Household owns or purchasing home	0.341	0.000	0.323	0.000
Equivalised income of others in the household	0.000	0.040	0.000	0.000
Presence of the CDEP scheme in the area	-0.128	0.003	-0.130	0.005
Percent of ERP employed in the CDEP scheme	-0.001	0.369	0.001	0.666
Constant	0.776	0.000	0.869	0.000
Probability of the base case	0.780		0.853	
Pseudo R-squared	0.1805		0.1767	
Number of observations	8,220		8,123	

Table 7A.24 Coefficient estimates and p-values for the CDEP scheme and individual, household and geographic factors associated with the probability of attending any education – Non-Indigenous males and females

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.593	0.000	-0.552	0.000
Aged 17	-1.055	0.000	-0.962	0.000
Speaks another language and English well	0.358	0.000	0.437	0.000
Speaks another language and English not well	0.034	0.650	-0.470	0.000
Born overseas	0.037	0.004	0.015	0.299
Parents born overseas	0.062	0.000	0.040	0.000
Moved between 1996 and 2001	-0.137	0.000	-0.218	0.000
Victoria	0.133	0.000	0.259	0.000
Queensland	-0.069	0.000	-0.005	0.640
South Australia	-0.043	0.001	0.036	0.017
Western Australia	-0.295	0.000	-0.307	0.000
Tasmania	0.019	0.375	-0.041	0.075
Northern Territory	-0.056	0.191	-0.047	0.327
Australian Capital Territory	0.289	0.000	0.246	0.000
Inner regional	-0.001	0.865	0.020	0.033
Outer regional	0.011	0.343	0.081	0.000
Remote	-0.157	0.000	0.024	0.496
Very remote	-0.396	0.000	-0.091	0.025
Single person household	-0.398	0.000	-0.623	0.000
Highest education in the household a degree	0.902	0.000	0.823	0.000
Highest education other qualification without Year 12	0.165	0.000	0.106	0.000
Highest education other qualification with Year 12	0.508	0.000	0.428	0.000
Highest education Year 12 but no qualification	0.392	0.000	0.350	0.000
At least one adult with different Indigenous status	-0.383	0.000	-0.504	0.000
Extra person in the household	-0.038	0.000	-0.008	0.061
Child under 15 in the household	0.274	0.000	0.238	0.000
Extra person per bedroom	-0.160	0.000	-0.225	0.000
Household owns or purchasing home	0.342	0.000	0.381	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Presence of the CDEP scheme in the area	-0.011	0.315	-0.068	0.000
Percent of ERP employed in the CDEP scheme	0.002	0.000	0.002	0.000
Constant	1.257	0.000	1.402	0.000
Probability of the base case	0.895		0.935	
Pseudo R-squared	0.1693		0.1756	
Number of observations	264,891		251,731	

Table 7A.25 Coefficient estimates and p-values for the CDEP scheme and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females in major cities

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.764	0.000	-0.587	0.000
Aged 17	-1.282	0.000	-1.047	0.000
Speaks another language and English well	-0.475	0.027	0.015	0.944
Speaks another language and English not well	*	*	-0.728	0.155
Torres Strait Islander[+]	-0.070	0.519	0.209	0.071
Born overseas	0.095	0.526	0.009	0.952
Parents born overseas	0.030	0.759	0.084	0.388
Moved between 1996 and 2001	-0.039	0.556	-0.334	0.000
Victoria	0.221	0.053	0.281	0.014
Queensland	0.291	0.000	0.224	0.006
South Australia	0.417	0.000	0.135	0.211
Western Australia	-0.151	0.174	-0.254	0.022
Australian Capital Territory	0.377	0.028	0.402	0.018
Single person household	-0.332	0.341	-0.207	0.604
Highest education in the household a degree	0.759	0.000	0.213	0.098
Highest education other qualification without Year 12	-0.055	0.531	-0.027	0.763
Highest education other qualification with Year 12	0.588	0.000	0.255	0.019
Highest education Year 12 but no qualification	0.493	0.000	0.113	0.200
At least one adult with different Indigenous status	0.121	0.088	0.126	0.069
Extra person in the household	0.008	0.807	0.033	0.258
Child under 15 in the household	0.314	0.000	0.246	0.001
Extra person per bedroom	-0.347	0.000	-0.323	0.000
Household owns or purchasing home	0.253	0.001	0.338	0.000
Equivalised income of others in the household	0.000	0.004	0.000	0.012
Presence of the CDEP scheme in the area	0.015	0.878	-0.017	0.883
Percent of ERP employed in the CDEP scheme	-0.001	0.726	-0.008	0.099
Constant	0.557	0.000	0.711	0.000
Probability of the base case	0.790		0.830	
Pseudo R-squared	0.1858		0.1556	
Number of observations	2,071		2,101	

* All those Indigenous males who speak another language and English not well were attending high school and hence they were excluded from the analysis

Table 7A.26 Coefficient estimates and p-values for the CDEP scheme and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females in regional Australia

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.730	0.000	-0.665	0.000
Aged 17	-1.243	0.000	-1.221	0.000
Speaks another language and English well	-0.032	0.810	-0.181	0.166
Speaks another language and English not well	0.745	0.383	*	*
Torres Strait Islander+	0.137	0.073	0.139	0.070
Born overseas	-0.296	0.010	-0.195	0.106
Parents born overseas	-0.056	0.513	0.069	0.427
Moved between 1996 and 2001	-0.120	0.011	-0.227	0.000
Victoria	-0.037	0.682	0.160	0.098
Queensland	0.110	0.062	0.153	0.013
South Australia	0.191	0.111	0.165	0.165
Western Australia	-0.454	0.000	-0.208	0.011
Tasmania	-0.317	0.000	-0.322	0.000
Northern Territory	0.035	0.773	0.218	0.089
Outer regional	0.019	0.679	-0.013	0.793
Single person household	0.088	0.735	-0.228	0.377
Highest education in the household a degree	0.618	0.000	0.624	0.000
Highest education other qualification without Year 12	0.260	0.000	-0.027	0.658
Highest education other qualification with Year 12	0.513	0.000	0.209	0.015
Highest education Year 12 but no qualification	0.320	0.000	0.254	0.000
At least one adult with different Indigenous status	0.199	0.000	0.198	0.000
Extra person in the household	-0.007	0.710	0.032	0.089
Child under 15 in the household	0.250	0.000	0.256	0.000
Extra person per bedroom	-0.169	0.001	-0.282	0.000
Household owns or purchasing home	0.346	0.000	0.394	0.000
Equivalised income of others in the household	0.000	0.369	0.000	0.000
Presence of the CDEP scheme in the area	-0.051	0.383	0.012	0.845
Percent of ERP employed in the CDEP scheme	-0.004	0.074	-0.007	0.002
Constant	0.610	0.000	0.686	0.000
Probability of the base case	0.723		0.830	
Pseudo R-squared	0.1672		0.1770	
Number of observations	4,093		4,002	

* All those Indigenous females who speak another language and English not well were attending high school and hence they were excluded from the analysis

Table 7A.27 Coefficient estimates and p-values for the CDEP scheme and individual, household and geographic factors associated with the probability of attending high-school – Indigenous males and females in remote and very Australia

	Male		Female	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Aged 16	-0.688	0.000	-0.756	0.000
Aged 17	-1.259	0.000	-1.409	0.000
Speaks another language and English well	0.005	0.959	-0.049	0.592
Speaks another language and English not well	-0.308	0.033	-0.494	0.002
Torres Strait Islander[+]	0.012	0.925	0.029	0.840
Born overseas	-0.084	0.719	0.432	0.145
Parents born overseas	0.746	0.000	0.106	0.654
Moved between 1996 and 2001	-0.118	0.186	-0.106	0.227
Victoria	-0.309	0.604	*	*
Queensland	-0.120	0.308	-0.146	0.251
South Australia	-0.277	0.115	0.133	0.475
Western Australia	-0.239	0.079	-0.351	0.015
Tasmania	-0.259	0.414	-0.717	0.027
Northern Territory	-0.078	0.553	-0.268	0.051
Very remote	-0.107	0.238	-0.056	0.550
Single person household	-1.078	0.050	0.922	0.085
Highest education in the household a degree	0.720	0.003	0.360	0.104
Highest education other qualification without Year 12	0.344	0.002	0.051	0.672
Highest education other qualification with Year 12	0.508	0.001	0.448	0.002
Highest education Year 12 but no qualification	0.349	0.000	0.133	0.146
At least one adult with different Indigenous status	0.152	0.077	0.387	0.000
Extra person in the household	-0.010	0.488	0.004	0.760
Child under 15 in the household	0.254	0.003	0.315	0.001
Extra person per bedroom	-0.082	0.053	-0.109	0.002
Household owns or purchasing home	0.323	0.002	0.304	0.011
Equivalised income of others in the household	0.000	0.005	0.000	0.024
Presence of the CDEP scheme in the area	-0.292	0.040	-0.215	0.146
Percent of ERP employed in the CDEP scheme	0.002	0.348	0.004	0.018
Constant	0.484	0.009	0.678	0.000
Probability of the base case	0.760		0.832	
Pseudo R-squared	0.1805		0.2023	
Number of observations	2,055		2,013	

* No Indigenous females in remote Victoria who speak another language and English not well were attending high school and hence they were excluded from the analysis

Appendix 8 Coefficient estimates and p-values for the factors associated with preschool and non-government school attendance

The tables in this Appendix give the coefficients and p-values for the estimates looking at the factors associated with preschool attendance (in Section 8A.1) and non-government schools (Section 8A.2).

8A.1 Coefficient estimates and p-values for factors associated with attending preschool

Table 8A.1 Coefficient estimates and p-values for factors associated with attending preschool – by age

	Age 3		Age4		Age 5	
Variable	Coeffic.	P-Value	Coeffic.	P-Value	Coeffic.	P-Value
Female	0.042	0.000	0.029	0.000	-0.013	0.193
Indigenous	0.135	0.000	-0.133	0.000	-0.373	0.000
Born overseas	0.057	0.000	-0.064	0.000	-0.167	0.000
At least one parent born overseas	-0.064	0.000	-0.095	0.000	-0.007	0.565
Degree in family	0.133	0.000	0.162	0.000	0.163	0.000
No year 12 in family	-0.048	0.000	-0.082	0.000	-0.096	0.000
Other children in family	0.008	0.233	-0.001	0.864	0.032	0.001
Household income in 1st quintile	-0.091	0.000	-0.169	0.000	-0.206	0.000
Household income in 2nd quintile	-0.056	0.000	-0.075	0.000	-0.089	0.000
Household income in 4th quintile	0.035	0.001	0.064	0.000	0.060	0.000
Household income in 5th quintile	0.177	0.000	0.147	0.000	0.115	0.000
Victoria	-0.460	0.000	-0.084	0.000	0.195	0.000
Queensland	-0.977	0.000	-0.481	0.000	0.694	0.000
South Australia	-1.287	0.000	0.280	0.000	1.077	0.000
Western Australia	-0.591	0.000	0.445	0.000	0.291	0.000
Tasmania	-0.818	0.000	-0.564	0.000	0.662	0.000
The Northern Territory	-0.966	0.000	0.374	0.000	0.121	0.020
The Australian Capital Territory	-0.944	0.000	0.003	0.887	0.587	0.000
Inner-regional area	-0.103	0.000	0.015	0.056	0.121	0.000
Outer-regional area	-0.144	0.000	0.022	0.031	0.142	0.000
Remote area	-0.190	0.000	-0.017	0.437	-0.009	0.807
Very remote area	-0.033	0.378	-0.345	0.000	-0.351	0.000
Constant	-0.291	0.000	0.356	0.000	0.556	0.000
Pseudo R-Squared	0.097		0.047		0.069	
Number of observations	200,437		195,262		90,841	

Source: Customised data from the 2001 Census

Table 8A.2 Coefficient estimates and p-values for factors associated with attending preschool – by Indigenous status (children aged 4-5 years)

	Indigenous		Non-Indigenous	
Explanatory variables	Coefficient	P-value	Coefficient	P-value
Aged 5 years	0.526	0.000	0.699	0.000
Female	0.036	0.129	0.021	0.000
Born overseas	-0.010	0.879	-0.098	0.000
At least one parent born overseas	0.135	0.009	-0.073	0.000
Degree in family	-0.070	0.198	-0.022	0.002
No year 12 in family	0.016	0.637	-0.150	0.000
Other children in family	0.406	0.000	0.476	0.000
Household income in 1st quintile	0.302	0.000	0.492	0.000
Household income in 2nd quintile	-0.012	0.874	-0.284	0.000
Household income in 4th quintile	-0.023	0.664	0.671	0.000
Household income in 5th quintile	0.226	0.103	0.138	0.000
Victoria	0.041	0.245	0.036	0.000
Queensland	0.007	0.843	0.037	0.000
South Australia	-0.108	0.034	-0.016	0.443
Western Australia	-0.418	0.000	-0.181	0.000
Tasmania	0.188	0.005	0.161	0.000
The Northern Territory	-0.141	0.000	-0.079	0.000
The Australian Capital Territory	0.011	0.647	0.007	0.192
Inner-regional area	-0.261	0.000	-0.168	0.000
Outer-regional area	-0.126	0.002	-0.075	0.000
Remote area	0.052	0.336	0.062	0.000
Very remote area	0.038	0.551	0.141	0.000
Indigenous preschool worker in area	0.126	0.000	0.020	0.007
Any preschool worker in area	0.038	0.403	-0.017	0.234
Constant	0.120	0.076	0.244	0.000
Pseudo R-Squared	0.061		0.067	
Number of observations	11 829		274 274	

Source: Customised data from the 2001 Census

8A.2 Coefficient estimates and p-values for factors associated with non-government school attendance

Table 8A.3 Coefficient estimates and p-values for factors associated with attending a non-government school – Indigenous males and females

	Males		Females	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Age	-0.002	0.665	-0.005	0.254
Infants or primary school student	-0.050	0.114	-0.134	0.000
Catholic	0.802	0.000	0.819	0.000
Other non-Christian religion	0.326	0.005	0.301	0.011
Australian Aboriginal Traditional Religion	-0.284	0.007	-0.124	0.204
No religion	-0.224	0.000	-0.283	0.000
Speaks another language and English well	0.252	0.000	0.181	0.000
Speaks another language and English not well	0.259	0.000	0.150	0.021
Torres Strait Islander+	-0.044	0.172	-0.052	0.107
Born overseas	-0.078	0.135	0.027	0.594
Parents born overseas	0.028	0.419	0.045	0.197
Moved between 1996 and 2001	-0.062	0.003	-0.100	0.000
Victoria	0.081	0.052	0.030	0.470
Queensland	0.092	0.000	0.063	0.014
South Australia	0.333	0.000	0.265	0.000
Western Australia	0.245	0.000	0.207	0.000
Tasmania	0.296	0.000	0.230	0.000
Northern Territory	0.139	0.001	0.252	0.000
Australian Capital Territory	0.350	0.000	0.443	0.000
Inner regional	-0.058	0.028	-0.069	0.009
Outer regional	-0.061	0.025	-0.060	0.028
Remote	-0.150	0.001	-0.145	0.001
Very remote	0.064	0.076	0.060	0.101
Single person household	0.620	0.063	0.392	0.332
Highest education in the household a degree	0.515	0.000	0.458	0.000
Highest education other qualification without Year 12	0.156	0.000	0.161	0.000
Highest education other qualification with Year 12	0.277	0.000	0.319	0.000
Highest education Year 12 but no qualification	0.177	0.000	0.209	0.000
At least one adult with different Indigenous status	0.030	0.168	0.020	0.377
Extra person in the household	-0.022	0.008	-0.026	0.002
Child under 15 in the household	0.003	0.758	0.020	0.051
Extra person per bedroom	0.033	0.047	0.009	0.572
Household owns or purchasing home	0.337	0.000	0.310	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Constant	-1.727	0.000	-1.534	0.000
Pseudo R-squared	0.1365		0.1373	
Number of observations	34,840		33,441	

Source: Customised data from the 2001 Census

Table 8A.4 Coefficient estimates and p-values for factors associated with attending a non-government school – Non-Indigenous males and females

	Males		Females	
Explanatory Variables	Coeffic.	P-Value	Coeffic.	P-Value
Age	0.002	0.012	-0.001	0.115
Infants or primary school student	-0.259	0.000	-0.279	0.000
Catholic	0.914	0.000	0.918	0.000
Other non-Christian religion	-0.080	0.000	-0.085	0.000
No religion	-0.464	0.000	-0.470	0.000
Speaks another language and English well	0.175	0.000	0.163	0.000
Speaks another language and English not well	0.128	0.000	0.178	0.000
Born overseas	-0.104	0.000	-0.093	0.000
Parents born overseas	0.048	0.000	0.057	0.000
Moved between 1996 and 2001	-0.021	0.000	-0.012	0.000
Victoria	0.085	0.000	0.108	0.000
Queensland	0.075	0.000	0.082	0.000
South Australia	0.227	0.000	0.246	0.000
Western Australia	0.081	0.000	0.109	0.000
Tasmania	0.244	0.000	0.264	0.000
Northern Territory	0.271	0.000	0.253	0.000
Australian Capital Territory	0.010	0.327	-0.008	0.426
Inner regional	-0.144	0.000	-0.142	0.000
Outer regional	-0.265	0.000	-0.270	0.000
Remote	-0.458	0.000	-0.447	0.000
Very remote	-0.531	0.000	-0.605	0.000
Single person household	0.437	0.000	0.295	0.000
Highest education in the household a degree	0.533	0.000	0.535	0.000
Highest education other qualification without Year 12	0.158	0.000	0.154	0.000
Highest education other qualification with Year 12	0.350	0.000	0.349	0.000
Highest education Year 12 but no qualification	0.298	0.000	0.287	0.000
At least one adult with different Indigenous status	-0.202	0.000	-0.161	0.000
Extra person in the household	0.003	0.161	-0.007	0.000
Child under 15 in the household	0.072	0.000	0.067	0.000
Extra person per bedroom	-0.190	0.000	-0.191	0.000
Household owns or purchasing home	0.229	0.000	0.223	0.000
Equivalised income of others in the household	0.000	0.000	0.000	0.000
Constant	-1.197	0.000	-1.085	0.000
Pseudo R-squared	0.1789		0.1789	
Number of observations	1,031,868		1,003,164	

Source: Customised data from the 2001 Census