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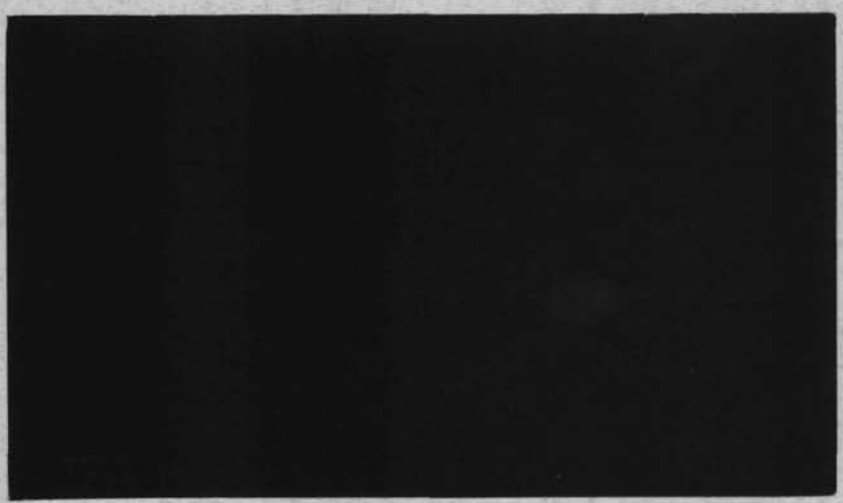

DISCUSSION PAPER

Estimating the social rate of return to education for Indigenous Australians

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Professor Jon Altman
Director, CAEPR
The Australian National University
December 1996

ABSTRACT

This paper compares estimates of the social rate of return to education for Indigenous Australians with those for non-Indigenous Australians. The social rate of return measures the net benefits to society of educating its citizens. If education is treated as an investment by society in its people, then Australian society will be made better off by an increase in educational investment as long as the social rate of return is higher than that for other public investments. This paper provides a discussion of the concept of the social rate of return to education and some estimates for Indigenous Australians.

Higher levels of education, in general, lead to an increased probability of finding employment and higher levels of income in employment. Hence, an increased level of education for an Indigenous person would be of advantage in economic terms; the private rate of return to education is likely to be quite high. In addition, we argue that increasing education has important social benefits (so-called 'externalities') for Indigenous people and society in general: improved education would lead to better nutrition, better living conditions, better access to health services, and hence a longer and healthier life. This means that productivity would be higher for Indigenous people and they would have higher incomes over a longer period of time. In addition, we argue that improved levels of education have the capacity to contribute to a decrease in the numbers of Indigenous people who are imprisoned, and thus lead to a direct reduction in the costs of imprisonment. Thus, increased education increases the earnings span, decreases prison costs and hence increases the social rate of return. We find that the social rate of return for education is generally higher for Indigenous Australians than for non-Indigenous Australians. This suggests, from a public policy perspective, that government should allocate increased funding for the education of Indigenous people since this social rate of return is greater than the Department of Finance recommended cut-off rates for government investment projects.

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Foreword

From time to time Centre for Aboriginal Economic Policy Research (CAEPR) staff collaborate with other academics at The Australian National University in policy-oriented research. This discussion paper is the result of such a collaboration between Ms Jin Liu, Research Officer at CAEPR and Dr Raja Junankar, Reader in the Public Policy Program, also at The Australian National University. Both Dr Junankar and Ms Liu have disciplinary training in economics, and the issue examined in this discussion paper is of specific interest to economists and economic planners. For the first time, they estimate the social rate of return for Indigenous Australians and compare this to the corresponding rate for other Australians. Their finding is that the social rate of return to education for Indigenous Australians is somewhat higher than for non-Indigenous Australians. This suggests, from a macro-level public policy perspective, that government allocation of funds to Indigenous education makes sense because the social rate of return to society of such expenditure exceeds the Commonwealth Department of Finance's recommended rate of return for government investment projects.

This finding certainly concurs with, and supplements, a growing body of research, much of which has been produced by CAEPR staff, that indicates that human capital investment results in improved employment (and associated income) outcomes for Indigenous Australians. It is certainly important from a public policy perspective that it is now established that both private and social rates of returns are positive for Indigenous people. The research reported here is somewhat different from most CAEPR work precisely because of its more macro-level analysis that examines the economic value of government spending to Australian society generally. It is likely to be of great interest to academic and central agency audiences, but of less interest to Indigenous regional and community sectors.

Professor Jon Altman
Series Editor
December 1996

The aim of this paper is to compare estimates of the social rate of return to education for Indigenous Australians with those for non-Indigenous Australians.[1] The social rate of return is calculated by economists to measure the net benefits to society of educating its citizens. If education is treated as an investment by society in its people, then Australian society should be better off by increasing educational investment as long as the social rate of return is higher than that for other public investments. Although there are numerous studies of the private rate of return to education (that is, the return accruing to individuals) for several countries and for different time periods, there are very few studies of the social rate of return. The distinctive contribution of this paper is to provide a discussion of the concept of the social rate of return to education and to provide some estimates for Indigenous Australians.

Our paper extends the private rate of return estimation to consider social costs and benefits.[2] Most people consider that education plays a very important role in society. Education is considered to lead to a more fulfilling life, and the ability to participate in all aspects of a modern society. In the language of John Herron, the new Coalition Minister for Aboriginal and Torres Strait Islander Affairs, improved education for Indigenous people is the key to 'empowering' them (Herron 1996). Higher levels of education, in general, lead to an increased probability of finding employment and obtaining higher levels of income. Hence, other things being equal, an increased level of education for an Indigenous person would be of advantage to that person, and the private rate of return to education is likely to be quite high. In addition, we argue that increasing one's level of education has important social benefits (so-called 'externalities') for Indigenous people and society in general: improved education has the capacity to lead to better nutrition, better living conditions, access to health services, and hence a longer and healthier life (increased life expectancy). This means that productivity would be higher for Indigenous people and they would have higher incomes over a longer period of time. In addition, we argue that improved levels of education have the capacity to contribute to a decrease in the numbers of Indigenous people who are imprisoned, and thus lead to a direct reduction in the costs of imprisonment. Thus, increased education increases the earnings span, decreases prison costs and hence increases the social rate of return.

We use data from the 1991 Census of Population and Housing to estimate the likely earnings of a person with differing levels of education and work experience at different ages. We then use these estimates to project into the future the additional earnings s/he would expect to earn if s/he had spent some additional time in education. We then estimate extra social benefits and social costs involved to calculate a rate of return to the investment in education. This is analogous to working out a rate of profit on investing in (say) a new factory. Not surprisingly, this is a controversial area and we highlight the limitations of our analysis in Appendix A2.

Investing in people

Although it is common for us to think about spending more time studying so that we may get a better and more highly paid job, economists have attempted to formalise the idea that we are investing in human beings. One of the first such discussions was in Becker (1964). He discussed the theory of human capital, arguing that we can consider the decision to spend a longer time in educational institutions as a form of investment which was similar to investing in (say) a factory or a new cafe. If we are considering whether to invest $1,000 in buying (say) a new farm machine, we need to work out whether we would increase our farm revenue by a large enough amount. Clearly, a simple alternative would be to put the $1,000 in a bank account and earn interest on the deposit. Unless the purchase of the farm machinery leads to earning at least as much as the interest rate from the bank, it would not seem worthwhile.

In the same way, Becker suggested that, if we consider the additional income from staying on for a little longer in school or college and compared it to the costs of education, we could work out the rate of profit (or the rate of return). The costs of education for a person are not only the extra costs of tuition fees, books, and other direct costs of staying on in additional education but also the income that the person will not be earning while studying. These forgone earnings can be a very significant cost for, say, a three-year degree, if this rate of return exceeds the market rate of interest s/he invests in her/his education. Of course the individual may not carry out these calculations very precisely, but may simply make some guesses when making a decision. In general s/he would expect to have a greater probability of finding work and getting a more highly paid job. The exact rate of return (or rate of profit) for different levels of education are likely to be different for different people. In the analysis below we are only considering the average rate of return. If these calculations are carried out simply in terms of what extra income an individual would get from education and the additional costs that the individual incurs, we call the rate of profit on education the 'private' rate of return. The precise method for carrying out these calculations is discussed in Appendix A1.

There is a marginal and average rate of return to investment on education: a rate of return can be 'marginal' where it refers to an additional level of schooling, while the 'average' refers to the comparison between discontinuous levels of schooling. There are ex-post and ex-ante rates of return: the ex-post rate would be a historical one referring to the earnings of a cross-section of the labour force at a particular point in time. In contrast, the ex-ante rate should refer to the expected earnings of new graduates. The relationship between costs and benefits is expressed in terms of the ratio between the present value of costs and the present value of expected future benefits, or in terms of the rate of return on investment. The purpose of any cost-benefit analysis is to compare the opportunity cost

of a project with the expected benefits, measured in terms of the additions to income that will accrue in the future as a result of the investment.

Investing in people: a social perspective

Human capital theory, with all its qualifications, is sometimes extended to estimate a social rate of return to education. Most studies simply use the pre-tax earnings in these calculations (instead of post-tax earnings as in the private rate of return estimates) and include not only the private costs of education, but also the full costs of education for the government sector. Since the costs of education are in the early part of the lifecycle and are much larger for society than for the individual (since in most countries the government subsidises education), the social rate of return is usually much lower than the private rate of return.

Information on taxes enables the distinction to be made between the social and private benefits of education. For example, if the before-tax earnings of a university graduate employed in the competitive sector of the economy is W per year, one can reasonably assume that this approximates the value society places on a graduate. However, if the graduate has to pay t per cent in taxes, then the benefit the individual realises is only W(1-t). The logic of using gross earnings in a social rate of return calculation is that, although taxes are paid out of the individual's pocket, gross earnings reflect the addition to society's production and hence welfare. Gross earnings are a better reflection of the contribution the individual makes to the productivity of society.

However, since the social rate of return measured using this method is lower than the private rate, it is argued by some that the government should decrease its investment in education. In general, if we are estimating the social rate of return we must allow for all social costs (including the forgone earnings of students) and social benefits and then compare the social rate of return with the opportunity cost of investing in education. If alternative government projects provide a lower social rate of return, there is an argument to expand education.[3]

The private returns aspect considers the relation between the costs incurred by private individuals in obtaining education and the benefits they, as individuals, derive from this education. The social rate of return includes the impact which one person's education can have on the welfare of others - for example, a reduction in delinquency and an improvement in standards of social responsibility (Johnes 1993). The increased earnings from education generate not only private benefits but also social benefits in the form of public goods paid for by these increased earnings, and savings in public welfare costs (McMahon 1987a, 1987b). The external benefits of education are those benefits to society that are above and beyond the

private benefits realised by the individual decision-maker, that is, the student and the family. External benefits to others that may be postulated include, for example, the satisfaction of living in a society with functioning democratic institutions and their related freedoms, lower crime rates, more books, more newspapers, and more literature.

If we are to define the social rate of return to education properly, we need to know the addition to society's welfare of an additional unit of education for (say) one person. If we use an individualistic welfare function (society's welfare is simply the sum of individual welfare), then if an individual gets additional income due to more education it would increase social welfare and hence increase the social rate of return. If, however, this additional income is simply compensated by someone else getting a lower income then society's welfare would be unchanged unless there is some explicit weighting given to income distribution. Another social welfare function proposed by Rawls (1971) argues that society's welfare depends on the welfare of the least well-off member of society. Since Indigenous people are by far the worst-off members of society, anything that improves their welfare improves society's welfare in the Rawlsian sense.[4]

In addition to the increased individual income, society may benefit from the additional education by increasing the benefit to other people in society. Thus, it is often argued that a more educated society can introduce new technology more easily. These 'externalities' are difficult to quantify. However, there is a large literature on the macroeconomic productivity benefits of education which suggests that there are significant externalities (see Denison 1962; World Bank 1993). Ideally, we should also include in social benefits the 'consumption benefits' of education, which are also difficult to quantify.

There are basically three types of benefits that belong to the social but not to the private domain. They include:

i the additional income stream which the individual obtains from additional education. This should be included as a social benefit as long as education is actually increasing the productivity of the person. This means that if education is simply a signalling device or is used as credentialism then some of the income stream is not a social benefit. In our estimates below we assume that increased education increases the productivity of the worker and hence is a social benefit as well. Tax payments associated with the educational benefit, (that is, income taxes paid out of one's lifetime income stream) should be included in social benefit;

ii 'external' benefits, which are those benefits that are due to the educational investment but that the individual cannot capture. An

example of the external benefits of education is the ability of the government to rely on individual filing of income tax returns, which would be impossible to achieve without general literacy (Cohn and Geske 1990). Another externality would be the impact of increased education on the health of the community and hence an increase in life expectancy. An important externality for Indigenous people may be that increased education decreases the probability of being imprisoned and hence decreasing costs for society of the prison system; and

iii indirect and intangible benefits to education would include the increases in productivity and incomes of workers other than those who receive education, whether through the diffusion of skills or the reorganisation of work procedures; education promotes technical change (and thus, ultimately productivity and output growth) in various ways ranging from the undertaking of research and development to the spread of knowledge through literacy; education increases allocative efficiency, by increasing the flexibility and mobility of the labour force, in response to changes in the demand for labour; education brings about many other gains of a social as well as economic character, including increased social cohesion, stability and democratic values.

The social costs are the real issue involved in education. If we assume market prices reflect equilibrium social opportunity costs,[5] then we should include the additional costs of education, the forgone income of an individual, and any other social costs. In our analysis we allow education to increase the life expectancy of Indigenous people, hence increasing the social benefits as they have a longer period over which they are earning an income. Another way we attempt to allow for externalities in our analysis is by allowing education to lower the probability of Indigenous people being imprisoned. We argue that, since a significant proportion of Indigenous people are imprisoned (especially younger males), if society increases the education of Indigenous people there will be fewer people who go to prison (there is a clear negative association between education levels and probability of being imprisoned).[6] If we now estimate the social costs as being lower due to the increased education levels, then we would find that the social rate of return would be higher. We do not make any allowance for the fact that if there is a decrease in the levels of criminal activity due to increased education there would also be increased benefits to the potential victims of crime and to society in general. Hence, any estimate we provide for the social rate of return would be lower bounds to the 'true' social rate of return. Table 1 summarises some of the potential costs and benefits.[7]

Table 1. Private and social costs and benefits.

Benefits	Costs
Private	Private
While in school	Direct
Part-time after tax earnings	Tuition and incidental schooling costs
While in the labour force	Indirect
After tax earnings	Forgone after tax earnings
Social	Social
While in school	Direct
Part-time before tax earnings	Total schooling costs
While in the labour force	Indirect
Before tax earnings for a longer period of time	Forgone earnings before tax
Externalities	Externalities
Better democracy	Lower prison costs
Increased technological change	

Source: Adapted from Psacharopoulos (1969).

The data and methods

The data used for this study are derived from the 1991 Census. As there are significant differences between the earnings of native-born Australians and overseas-born Australians, we have focused simply on comparisons of Indigenous people with other native-born Australians. Regression equations have been estimated and used to calculate the internal rate of return to an additional year of schooling and to the completion of a post-schooling qualification for males and females aged 15-64 years in full-time and part-time employment (these results are presented in Appendix A3). The results for other Australians have been derived from the 1 per cent public-use sample of the census and those for Indigenous Australians from the full Aboriginal sub-file of the 1991 census. The 1 per cent public-use sample of the population census includes a very small number of Indigenous adults, which would not provide sufficient degrees of freedom for econometric estimation of earnings functions. The Australian Bureau of Statistics (ABS) ran the regression equations on the full sub-file of Indigenous Australians.

The private benefits of education are the additional earnings of the higher level of education compared to the previous level of education, and are based on the predicted earnings for both groups. The private costs of investing in education are additional incidental school-related costs incurred by individuals, such as direct costs of tuition fees and books, Higher Education Contribution Scheme (HECS) charges for those at university, and forgone incomes net of income tax. These forgone earnings are a significant cost in the earlier part of the life cycle and hence have a

large impact on the calculated private rate of returns. In calculating these private rates of return, we also allow for the fact that students from low-income households are eligible for AUSTUDY and ABSTUDY (Daly and Liu Jin 1995). Since the earnings are estimated from cross-sectional data, we have allowed for increases in wages over time due to general productivity growth in the economy. These growth rates are estimated over 1986 to 1991 for each educational level and assumed to apply to Indigenous and non-Indigenous Australians.[8] In addition, we have also allowed the probability of employment to be affected by the increased education, hence increasing the expected future incomes because of improved levels of education.

We have treated the social benefits as including the private benefits of additional incomes (but taken as gross earnings, rather than net earnings) assuming that there is no difference between market wages and shadow wages (equilibrium wages from a societal point of view). We argue that increased education not only increases the income stream at each date in the future but also extends the life of Indigenous people and hence their working life. This externality of increased working life expectancy is applied in estimating social rates of return.[9] The average life expectancy for male and female Indigenous persons was assumed to be 44 years and 46 years respectively[10] and, for other Australians, a working life terminating at 64 years. 'Life expectancy for Aboriginal males was estimated to be 16 to 18 years shorter than for non-Aboriginal males during 1990-92; the gap was slightly wider for Aboriginal females' (Bhatia and Anderson 1995: 12). The differences of rates of return between working life expectancy of 44 years (female) or 46 years (male) and increasing working life expectancy to 64 years for Indigenous Australians are only marginal because of the process of discounting lifetime earning after the peak earning capacity.[11]

For the social costs of education, we have allowed for the total resource costs to society. Besides opportunity costs incurred by individuals, namely, income forgone during school attendance, there are additional incidental school-related costs incurred by individuals for private rate of return such as direct costs of tuition fees and books and HECS charges for those at university. In addition, we include government costs for education per person (at all levels of government) for those in post-compulsory secondary education, which includes school costs incurred by society, that is, teachers' salaries, supplies, interest and depreciation on capital and society's costs which are normally defrayed though taxation. Income support to individuals under AUSTUDY and ABSTUDY are considered as transfer payments rather than as part of social cost to education. The only element which would be relevant would be the real resource costs involved in administering such allowances. As we have inadequate information about these administrative costs (and in any case they are likely to be small) we have ignored them in our estimates.

Another issue that we explicitly assumed as an externality is that education lowers crime and hence decreases the numbers of people imprisoned, which decreases the prison costs for society.[12] Appendix Table B1 shows that 3.4 per cent of Indigenous males are in prison compared to 0.18 per cent of other male Australians. Appendix Table B2 provides information on the distribution of the percentage of prisoners by age group. This shows that the highest percentage of prisoners for males are at age 20-24 years and for females at 25-29 years, but for both males and females most of them are concentrated in the age range 20-40 years. Appendix Table B3 provides information by labour market status and shows that most prisoners are likely to be unemployed or of unknown labour market status. Appendix Table B4 shows that people with lower levels of education are more likely to be arrested. We estimate the social rates of return allowing for this dimension by assuming that Indigenous Australians have the same employment probability and the same percentage of prisoners as other Australians so that average lifetime earnings are adjusted accordingly.

The results and interpretation

In this section we provide estimates of the private and social rates of return to additional years of education. The private rate of return is likely to influence the decision of individuals to continue their education if they choose to maximise their lifetime incomes. It is probably true that a significant proportion of Indigenous people make this choice, especially if they live a traditional lifestyle in remote regions. However, the social rate of return builds on this private rate of return by including various social costs and benefits discussed earlier. For a government, it is important to know what would be the additional benefit to society of increasing expenditure on additional education for (say) Indigenous people. As discussed earlier, if the social rate of return to additional expenditure on education is large and greater than some alternative public investment, then the government should expand education.

The results and interpretation reported in this section estimate the internal private and social rates of return to education based on predicted income from estimates based on earning functions regressions (see Appendix Tables A1 and A2) with appropriate adjustments for additional costs and benefits. Results are reported for both males and females, Indigenous and other Australians.

Table 2 presents comparisons of the private rate of return to education for Indigenous and other Australian males and females with adjustments for the proportion of students receiving AUSTUDY or ABSTUDY (Appendix Table A3). Seventeen per cent paid HECS in advance with 15 per cent discount in 1991 and 83 per cent of students paid HECS after graduation above a certain income level. ABSTUDY or AUSTUDY payment is

calculated as an average of the payment for maximum 'living at home', maximum 'living away' and maximum 'independent'.

Table 2. Private rate of return to education with AUSTUDY or ABSTUDY aged 15-64 years, 1991 (assuming proportional income support, adjusting for mean wage growth rates and employment probabilities.

Aboriginality and sex	Als[1] 15/16 Per cent	Als 15/17 Per cent	Als 15/18 Per cent	Age 17[2] Cert. Per cent	Age 17[3] Dip. Per cent	Age 18-20[4] Degree Per cent	Age 18-21[5,6] Degree Per cent
Females							
(a) Other 64	18.3	14.7	9.9	3.4	12.6	12.4	13.4
(b) Indigenous 44	11.5	15.7	11.8	14.9	26.4	19.2	20.6
(c) Indigenous same as Other*	12.6	15.0	9.7	8.3	22.9	16.7	17.6
Males							
(d) Other 64	23.2	16.9	12.3	13.6	16.7	19.6	19.7
(e) Indigenous 46	10.7	14.4	12.4	27.6	28.5	21.8	23.3
(f) Indigenous same as Other*	10.7	12.6	9.8	26.7	25.2	20.9	20.8

(a) Other Australian females with working life terminating at 64 years with own employment probability adjustment.
(b) Indigenous females with working life terminating at 44 years with own employment probability adjustment.
(c) Indigenous females same as Other Australian females in terms of employment probabilities.
(d) Other Australian males with working life terminating at 64 years with own employment probability adjustment.
(e) Indigenous males with working life terminating at 46 years with own employment probability adjustment.
(f) Indigenous males same as Other Australian males in terms of employment probabilities.
* Rows (c) and (f) are virtually unchanged if we allow for Indigenous workers to work until 64 years of age like Other Australians.

1. Als: Age left school.
2. Assuming a certificate (Cert.) involves two years of full-time study.
3. Assuming a diploma (Dip.) involves two years of full-time study.
4. Assuming a degree (Age 18-20/Degree) involves three years of full-time study.
5. Assuming a degree (Age 18-21/Degree) involves four years of full-time study.
6. Age18-21/Degree is under assumption that the income growth rate equals the average growth rate over the period 1986-91. It is also assumed that we have full employment.

Table 3 presents comparisons of the social rate of return to education for Indigenous and other Australian males and females. All these results are adjusted for mean wage growth rates and different employment probabilities and externalities. The first half of the Tables relates to the rate of return to continuing secondary education; the second part of these Tables relates to post-secondary qualifications. The social cost, that is, per capita expenditure in 1991 for education, is highest for higher education ($6,797),[13] then $3,329 for schooling and $1,920 for Technical and Further Education (TAFE) college (ABS 1991). Table 4 provides information on

the differences between the social rate of return and private rate of return by gender.

Table 3. Social rate of return to education, aged 15-64 years, 1991 (adjusting for mean wage growth rates, employment and crime probabilities).

Aboriginality and sex	Als[1] 15/16 Per cent	Als 15/17 Per cent	Als 15/18 Per cent	Age 17[2] Cert. Per cent	Age 17[3] Dip. Per cent	Age 18-20[4] Degree Per cent	Age 18-21[5,6] Degree Per cent
Females							
(a) Other 64	15.5	11.7	7.4	2.3	11.0	8.9	10.9
(b) Indigenous 44*	9.1	9.7	6.7	12.0	19.2	15.3	17.5
(c) Indigenous same as Other	11.2	11.2	6.8	6.3	16.3	13.5	15.0
(d) Indigenous with crime cost	9.3	9.8	6.8	12.2	19.3	15.5	17.6
Males							
(e) Other 64	20.4	14.8	10.9	13.4	14.8	18.1	18.9
(f) Indigenous 46*	8.9	9.5	8.2	22.6	21.3	19.0	20.8
(g) Indigenous same as Other	9.7	9.6	7.5	22.0	18.9	18.2	18.8
(h) Indigenous with crime cost	9.2	9.7	8.4	22.8	21.6	19.1	21.0

(a) Other Australian females with working life terminating at 64 years with own employment probability adjustment.
(b) Indigenous females with working life terminating at 46 years with own employment probability adjustment.
(c) Indigenous females same as Other Australian females in terms of employment probabilities.
(d) Indigenous females same as (b) but with additional adjustment by crime cost.
(e) Other Australian males with working life terminating at 64 years with own employment probability adjustment.
(f) Indigenous males with working life terminating at 46 years with own employment probability adjustment.
(g) Indigenous males same as Other Australian males in terms of employment probabilities.
(h) Indigenous males same as (f) but with additional adjustment by crime cost.
* Rows (b) and (f) are virtually unchanged if we allow for Indigenous workers to work until 64 years of age like Other Australians.

1. Als: Age left school.
2. Assuming a certificate (Cert.) involves two years of full-time study.
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5. Assuming a degree (Age 18-21/Degree) involves four years of full-time study.
6. Age18-21/Degree is under assumption that the income growth rate equals the average growth rate over the period 1986-91. It is also assumed that we have full employment.

The private rate of return in Table 2 provides calculated rates for other Australians in row (a) assuming that the incomes are expected incomes using the predicted earnings for people with the appropriate levels of education and weighted by the probabilities of employment for each age and education category. It is assumed that other Australians work until they

reach the age of 65 years. In each cell, the income component is the (mathematical) expected value of additional earnings for the level of education (compared to the previous level of education). In other words, we take the additional earnings times the probability of employment plus the unemployment benefit times the probability of unemployment. Row (b) provides calculated rates of return for Indigenous people with a life expectancy of 44 years for females[14] and with the employment probabilities of that group. Row (c) provides similar information, assuming a scenario that Indigenous females have similar employment probabilities to Other Australians. Rows (d), (e) and (f) give similar calculations for males who are assumed to work until the age of 46 years. Sensitivity analyses for private rates of return (such as assuming a student with or without ABSTUDY or AUSTUDY) are attached in Appendix C, Table C1 and Table C2.

Indigenous people with low levels of education have lower private rates of return to education than non-Indigenous Australians suggesting that for this group there may be significant difficulties in finding employment, and they may have lower wage rates if they do find employment. This may be due to discrimination. It is interesting to see, however, that Indigenous people with higher levels of education have higher employment probabilities than other Australians. This suggests that, since only a small minority of Indigenous people have higher levels of education they are in a favourable position in the labour market. If everyone from this group had a higher level of education, we might have to adjust the employment probabilities towards that of non-Indigenous Australians to get a better idea of how the rate of return would appear. At present, highly educated Indigenous people may have relatively high employment probabilities compared to non-Indigenous Australians due to some kind of scarcity value. However, we have not made such corrections.

Let us focus on the private rate of return for males, who have a higher probability of a continuous working life, and hence these estimates are probably more reasonable for males than for females. When we compare the private rate of return for different levels of education for a particular group, we see that for non-Indigenous Australians they seem to follow a U-shape with high rates for low levels of education, falling for intermediate levels and then rising for degrees. For Indigenous people, there appears to be an inverted U-shape: low rates for low levels of education, rising steeply for intermediate levels, and then falling slightly for degree levels. This significantly different pattern needs further exploration. It may be a reflection of greater inequality of earnings amongst Indigenous people compared to non-Indigenous Australians.

Table 3 provides our estimates of the social rate of return to education for Indigenous and non-Indigenous Australians. As mentioned earlier, these estimates use gross earnings, and include all social expenditures on

education, and allow for an individual's forgone earnings. Rows (c) and (g) make an adjustment to the calculated rates of return by assuming that the employment probabilities are the same as for non-Indigenous Australians and implicitly assuming that the probabilities of being imprisoned are the same for Indigenous and non-Indigenous Australians. In addition, for Indigenous people we have included prison costs, using the probabilities of being in prison; see rows (d) and (h), (assumed to be the same in 1991 as in 1994, and assuming that the probabilities of being in prison are the same as being arrested, see Appendix B). This inclusion obviously raises the social rate of return for Indigenous people, *ceteris paribus*, since there is reduced expenditure on prisons due to improved education.[15]

Table 4. Differences between social and private rates of return to education, aged 15-64 years, 1991 (assuming full income support, adjusting for mean wage growth rates, employment and crime probabilities, and proportional student receiving AUSTUDY or ABSTUDY).

Aboriginality and sex	Als[1] 15/16 Per cent	Als 15/17 Per cent	Als 15/18 Per cent	Age 17[2] Cert. Per cent	Age 17[3] Dip. Per cent	Age 18-20[4] Degree Per cent	Age 18-21[5] Degree Per cent
Females							
(a) Other 64	-2.9	-3.0	-2.5	-1.1	-1.6	-3.5	-2.5
(b) Indigenous 44	-2.4	-6.0	-5.1	-2.9	-7.2	-3.9	-3.1
(c) Indigenous same as Other	-1.4	-3.8	-2.9	-2.0	-6.6	-3.2	-2.6
(d) Indigenous with crime cost	-2.3	-5.9	-5.0	-2.7	-7.1	-3.7	-2.9
Males							
(e) Other 64	-2.8	-2.1	-1.4	-0.2	-1.9	-1.5	-0.8
(f) Indigenous 46	-1.8	-4.9	-4.1	-5.0	-7.2	-2.8	-2.5
(g) Indigenous same as Other	-1.0	-2.9	-2.3	-4.7	-6.3	-2.7	-2.0
(h) Indigenous with crime cost	-1.4	-4.7	-4.0	-4.8	-6.9	-2.6	-2.3

Denotation:

(a) The difference between social and private rate of return for Other Australian females.
(b) The difference between social and private rate of return for Indigenous females.
(c) The difference between social and private rate of return with same employment probability for Indigenous females.
(d) The difference between social (with additional crime cost) and private rate of return for Indigenous females.
(e) The difference between social and private rate of return for Other Australian males.
(f) The difference between social and private rate of return for Indigenous males.
(g) The difference between social and private rate of return with same employment probability for Indigenous males.
(h) The difference between social (with additional crime cost) and private rate of return for Indigenous males.

1. Als: Age left school.
2. Assuming a certificate (Cert.) involves two years of full-time study.
3. Assuming a diploma (Dip.) involves two years of full-time study.
4. Assuming a degree (Age 18-20/Deg.) involves three years of full-time study.
5. Assuming a degree (Age 18-21/Deg.) involves four years of full-time study.

Table 4 summarises the differences between social and private rates of return for males and females. This shows clearly that the social rate of return is lower than the comparable private rate of return. It is interesting to note that the private rate of return for a degree is extremely high (for both Indigenous and non-Indigenous people) compared to any alternative investment that the individual could make. The private rate for staying on in school until 18 years is also fairly high. It is also interesting to note that if Indigenous people with education have the same employment probability as non-Indigenous people then the private rate of return is less than if their own employment probabilities are used. This is because few Indigenous people achieve such levels of education and then have higher employment probabilities than for non-Indigenous people. If we allow education to decrease the probability of being imprisoned, then the social rate of return is higher (compare row (b) with row (d) for females, and (f) with (h) for males).

Although we do not present tables where we allow for Indigenous people with more education to have an increased life expectancy to equal that of non-Indigenous Australians, we found that it made very little difference to the rate of return. This is because the earnings of Indigenous people had already peaked by the age of 46 years (for males) and 44 years (for females) and the extra years of declining earnings when discounted made very little difference.[16]

Conclusion

In this paper we have provided estimates of private and social rates of return to education for Indigenous and non-Indigenous Australians under different assumptions. In our analysis we discussed the social benefits of education for Indigenous people. In particular, we argued that increasing the levels of education would improve the health of Indigenous people and hence increase their life expectancy. This increased life expectancy would increase the number of years that Indigenous people would be working productively and hence increase the benefits to society. Another important social benefit, we argued, was that improved education led to a lower probability of being arrested and hence imprisoned. Following on from this, we argued that a lowering of imprisonment would increase the working life of Indigenous people and hence increase society's wellbeing. In addition, a lower rate of crime would decrease society's expenditure on policing and prisons, and hence lead to a social improvement.

Using a fairly common methodology for calculating the private benefits of education, we extended this method to quantify some of the social costs and benefits and were able to get estimates of the private and social rates of return to education. Our results show that the rate of return (both private and social) to education is fairly high. In particular, we pointed out the

curious result that, as education levels increased, the rate of return followed a U-shape for non-Indigenous Australians but an inverted U-shape for Indigenous Australians. This result needs further exploration to provide an explanation. Our results also show that the social rate of return is in general lower than the private rate of return, primarily because social expenditure on education exceeds private expenditure (education is subsidised by the State). In our estimates of the social rate of return we argued that we should allow for all social costs and benefits and made a tentative beginning by allowing education to lower the probability of going to prison and hence lowering social costs. We also allowed for education to improve health by allowing life expectancy to increase. Our results show that making these allowances increases the social rate of return marginally.

In all cases we find that the social rate of return are very high and clearly exceed the Department of Finance's recommended cut-off rate for public projects. This analysis suggests that the government should increase its funding of education for Indigenous people.

Notes

1. The paper is an extension of a previous paper by Daly and Liu (1995) which provided estimates of the private rate of return to education for Indigenous and non-Indigenous Australians.

2. The paper is located firmly in the human capital context, discussed by Becker (1964), Mincer (1974), Blaug (1970), and Psacharopoulos (1981, 1985), and is subject to the same limitations as most of the studies in this genre.

3. Strictly speaking, this is true if the marginal social rate of return is high. However, all estimates of rate of return are the average rates.

4. The Rawlsian Social Welfare Function is based on the idea of the 'veil of ignorance': if we do not know where in the income distribution we may happen to fall, we may wish society to help the worst-off person.

5. To the extent this assumption is invalid we would need use shadow prices. However, that is a huge task which we do not even attempt.

6. In some preliminary research (using data on Indigenous people) we have carried out there is a significant relationship between the level of education and the probability of being arrested, controlling for various factors including age and income. We assume that there is a fairly stable relationship between the probability of being arrested and being imprisoned.

7. It is of course possible that the increased labour supply of Indigenous labour may lead to a fall in wages and hence in taxes collected by the government. However, this is likely to be a very small effect.

8. It is assumed that these growth rates are the same for both groups for each educational level.

9. It is, of course, true that if Indigenous people live longer there may be increased expenditures on health. However, in most other cases for non-Indigenous people we think of a longer life as a benefit.

10. This is the life expectancy at birth, not at the relevant age (say) 16 years, which is likely to be larger. However, we do not have any estimates for life expectancy at different ages and are therefore unable to make any allowance for these differences.

11. The peak estimated earnings for Indigenous males are at 44 years compared to non-Indigenous Australian males whose peak earnings are at 42 years. The peak estimated earnings for Indigenous females are at 41 years compared to 'Other Australian' females at 42 years.

12. As mentioned earlier, our preliminary results, using National Aboriginal and Torres Strait Islander Survey data, show such a relationship.

13. Note these costs include an element which covers research in higher education. It is difficult to allocate what proportion of this should be excluded.

14. Note that Other Australians are assumed to work continuously until the age of 64 years. This is a shaky assumption for males and certainly untrue for females. However, incomes towards the end of the working life have a very small effect on the rate of return as they are heavily discounted.

15. Note that these rows cannot be compared to similar rows in Table 2. Ideally, we should provide a row which shows the social rate of return when we include the costs of prison and then allow education to decrease these prison costs.

16. When we have discount rates of over 20 per cent, earnings 20 or so years in the future are almost zero in present value terms. Simple experiments where we increased the terminal earnings by over a hundred-fold made little difference to the rate of return.

Appendix A1. Estimating rate of return

The empirical procedure for estimating the rate of return on education is as follows: earnings functions are estimated with log of earnings as the dependent variable and with independent variables which include years of schooling (or educational dummy variables), work experience (usually proxied as age minus age left school), and controlling for some demographic characteristics like marital status, number of children, and so on. Usually these equations are estimated on cross-section data. It is then postulated that the expected future earnings would follow the same path as the pre-existing cross-section estimates. This extrapolation is obviously based on some strong assumptions, including steady state equilibrium conditions with no growth in earnings, and no changes in wage differentials due to changing demand or supply conditions. If we used longitudinal data it would be an improvement: however, there are very few studies based on longitudinal data, and since these data do not exist in Australia we have to rely on cross-section estimates. Ideally, we need to know the expected future lifetime income stream of each individual, which is of course not feasible.

These predicted earnings are then used to calculate the rate of return as that discount rate which makes the present value of the resulting net benefit stream (the difference between the benefits and costs) equal to zero:

$$\sum B_{ij} / (1+r)^i - \sum C_{ij} / (1+r)^i = p_j = 0, \qquad (1)$$

where B_{ij} = the additional earnings at each age i associated with additional education j; C_{ij} = the costs of education at age i associated with additional education j; and P_j = the present value of additional education j. The rate of return to education is defined as that rate of discount which equates the sum of the discounted value of benefits to the sum of the discounted value of costs of education. An alternative method of computing the rate of return to education is to regress the natural logarithm of earnings on schooling (Mincer 1974; Willis 1986). The resulting coefficient of schooling is interpreted as the rate of return.

Appendix A2. The limitations of estimated rate of return

There are several limitations related to this estimation

i We are comparing the rate of return for a very small group of Indigenous people with post-secondary and higher levels of education with a much larger group of non-Indigenous Australians. If the levels of education of Indigenous people were up to the levels of that of non-Indigenous Australians, then the wage differentials might change (in a general equilibrium sense). Hence, we may be over-estimating the rate of return to education for a general increase in education levels, although they would be appropriate to an individual increasing her/his level of education.

ii We have assumed that wage growth between the 1986 and 1991 Censuses will be continued. We also assumed that this wage growth is identical for Indigenous and non-Indigenous Australians. Since we have used cross-section estimates to get our predicted earnings, we are implicitly assuming that existing wage differentials will continue into the indefinite future. In other words, any changes in behaviour which would increase the supply of (say) people with degrees does not affect the equilibrium wage.

iii We make all the usual human capital theory assumptions, including that individuals choose that investment plan which maximises the present value of earnings over the life cycle. This assumption is particularly problematic for Indigenous people. Given the cultural and historical background of Indigenous people, it is unlikely that they would be following such an optimising approach.

iv For Indigenous people, the earnings that we have used would not include non-market earnings such as from hunting and fishing, which would bias our estimates. In our estimates of earnings functions we have used total income as the dependent variable which includes the income from Community Development Employment Projects (CDEP) scheme employment for Indigenous people. This may lead to a bias since some participants in the CDEP scheme appear to have been classified not only as 'unemployed' but also 'not in the labour force' in the census (Altman and Daly 1992). We have not included those people who are 'not in labour force' in our sample.

v The social rate of return is estimated by using observed market earnings assuming that wages are equal to the value of the marginal product of labour (labour markets are perfect). If we did not make this assumption we would have to estimate shadow wages. In a centralised wage bargaining system like we have in Australia, it is not clear to what extent the centralised wage bargains simply rubber stamp competitive market wages or to what extent they introduce distortions. This is another area which needs further exploration.

vi We have made no corrections for the possibility that there is selection bias, that is the more educated are of higher ability. We have assumed that the higher earnings of the more educated simply reflect a return on that education.

Appendix A3. Definition of variables list and definitions for earnings function 1991 Census

All variables for ages from 15 to 64 years (inclusive).

1. Australian Indigenous: Aborigines and Torres Strait Islanders.

2. Australian others: native-born Australians.

3. Age on leaving school (als): dns - did not go to school
als 14 - age left school at 14 or younger
als 15 - age left school at 15
als 16 - age left school at 16
als 17 - age left school at 17
als 18 - age left school at 18
als 19 - age left school at 19 or older.

   The omitted age on leaving school grouping is the als 15.

4. Qualification
   (1) University degree includes higher degree, post-graduate diploma and bachelor degree.
   (2) Diploma includes undergraduate diploma, associate diploma.
   (3) Certificate includes skilled vocational, basic vocational and level of attainment inadequately described.
   (4) The omitted qualification grouping denotes those holding no qualification.

5. Marital status
   (1) Married, single, and other (separated, divorced and widowed).
   (2) The omitted marital status grouping is single.

6. Dependent children
   Number of dependent offspring present from 0 to 8.

7. Language
   Takes the value of 1 for those with poor English language skills.

Table A1. Earnings function for Indigenous and non-Indigenous Australians by gender, 1991.

Variables[a]	Indigenous Males	Indigenous Females	Others Males	Others Females
Constant	7.8101	7.4795	7.3264	6.7494
	(224.4)[b]	(157.8)[b]	(184.5)[b]	(131.7)[b]
Age	0.0889	0.0983	0.1188	0.1243
	(43.4)[b]	(34.1)[b]	(52.7)[b]	(40.9)[b]
Age squared	-0.0010	-0.0012	-0.0014	-0.0015
	(-37.6)[b]	(-29.2)[b]	(-49.1)[b]	(-37.8)[b]
Age on leaving school[d]				
No schooling	-0.3834	-0.2671	-0.2720	-0.3452
	(-15.4)[b]	(-6.6)[b]	(-3.0)[b]	(-2.16)[c]
<=14 years	-0.0606	-0.0425	-0.0412	-0.0335
	(-5.4)[b]	(-2.6)[b]	(-2.7)[b]	(-1.4)
16 years	0.0519	0.1333	0.1432	0.2176
	(5.3)[b]	(10.7)[b]	(13.0)[b]	(15.1)[b]
17 years	0.1208	0.2414	0.1858	0.2864
	(10.1)[b]	(16.7)[b]	(15.7)[b]	(18.9)[b]
18 years	0.1591	0.2388	0.1964	0.2693
	(9.7)[b]	(12.0)[b]	(13.8)[b]	(14.0)[b]
19 years	-0.0303	0.0920	0.1363	0.2641
	(-1.3)	(3.3)[b]	(-6.7)[b]	(9.6)[b]
Qualifications[d]				
Certificate	0.3495	0.2278	0.1702	0.1546
	(33.7)[b]	(13.3)[b]	(18.5)[b]	(9.1)[b]
Diploma	0.4178	0.4147	0.2997	0.2952
	(15.4)[b]	(20.4)[b]	(16.7)[b]	(16.7)[b]
University degree	0.5759	0.5772	0.5226	0.4393
	(19.4)[b]	(20.3)[b]	(38.1)[b]	(25.2)[b]
Marital status				
Married	0.1398	-0.1414	0.1628	-0.1524
	(14.9)[b]	(-11.8)[b]	(13.4)[b]	(-9.8)[b]
Other	0.0974	0.0537	0.1056	0.1239
	(6.6)[b]	(3.2)[b]	(5.9)[b]	(5.8)[b]
Dependent children	0.0089	0.0242	0.0167	0.0568
	(8.0)[b]	(17.6)[b]	(13.9)[b]	(37.9)[b]
Language	-0.4528	-0.3188	0.0978	-0.1070
	(-19.0)[b]	(-9.5)[b]	(0.8)	(0.8)
R^2	0.23	0.19	0.30	0.26

a. 't' statistics in parentheses.
b. Significant at 1 per cent level.
c. Significant at 5 per cent level.
d. Joint F-test significant at 1 per cent level (one-side or two-side tests as appropriate).

Source: 1991 Census.

Table A2. Mean wage and growth rate from 1986-91 for all Australians, by sex, section-of-State, qualification level and age left school, 1986 and 1991 Census.

Qualification levels	1986 Males	1991 Males	Growth rate	1986 Females	1991 Females	Growth rate
Total areas						
Degree	32,417	45,702	1.41	19,719	26,707	1.35
Diploma	28,761	35,347	1.23	15,440	20,747	1.34
Certificate	20,140	26,307	1.31	11,340	15,091	1.33
Non-qualification	14,387	18,954	1.32	7,781	11,910	1.53
Average	17,719	23,758	1.34	9,266	14,040	1.52
Age left school						
Total areas						
Als 15	17,307	23,074	1.33	8,217	12,658	1.54
Als 16	18,135	24,177	1.33	9,891	14,425	1.46
Als 17	21,384	28,704	1.34	12,613	17,466	1.38
Als 18	21,890	29,155	1.33	12,829	17,550	1.37
Als 19	23,461	30,950	1.32	13,571	19,481	1.44
Average	19,186	25,994	1.35	10,142	15,238	1.50

Note: Other areas include other urban and rural areas.

1. Assuming that wage rate for Indigenous is same as for others by the level of qualification and by section-of-State.
2. Average wage growth rate is assumed no discrimination for Indigenous and marginal productivity equal to wage rate.
3. Wage growth rate will be calculated from 1986 rather than 1981 and 1991 censuses. There are two reasons why the 1981 Census can not be used for this purpose: the limited sample for Indigenous Australians- about 1,500 cases, and no geographic areas divided wage rate for other Australians.

Source: 1986 and 1991 Census.

Table A3. Percentage of recipients of AUSTUDY or ABSTUDY by sex, age 15-22 years, 1991.

Age	Indigenous		Other	
	Males	Females	Males	Females
	ABSTUDY		AUSTUDY	
16 years	56.2	65.0	32.5	35.8
17 years	44.9	52.3	22.9	27.5
18 years	20.2	24.0	15.5	20.3
19 years	14.0	18.5	10.6	14.3
20 years	12.2	15.0	7.2	9.0
21 years	9.6	13.9	5.1	5.5
22 years	9.2	11.8	3.7	3.6

Source: Department of Employment, Education, Training and Youth Affairs.

Table B1. Number and percentage of prisoners, by sex and Aboriginality, 1991.

	Number	Per cent	Number Per 100,000	Number Percentage
Indigenous				
Male	2,045	(94.4)	3,403	3.40
Female	121	(5.6)	188	0.19
Sub-total	2,166	(100)	1,739	1.74
Other				
Male	11,716	(95.1)	183	0.18
Female	607	(4.9)	9	0.01
Sub-total	12,323	(100)	95	0.10
Total				
Male	13,761	(95.0)	221	0.22
Female	728	(5.0)	11	0.01
Sub-total	14,489	(100)	115	0.12

Notes:

1. The additional crime cost for Indigenous males and female compared with Other Australians are $1,466 and $81, which is calculated by $45,537 cost per prisoner in 1991 times the difference percentage 3.22 (male) and 0.18 (female) of prisoners between Indigenous (male or female) and Other Australians (male or female).
2. The proportional deduction of social benefit from being in prison by level of education is applied, which causes increased rate of return. The increased rate of return after adjusting for crime cost is because of widening the stream of lifetime earnings. The widening increased stream of lifetime. earnings is because of higher probability of being in prison (bigger loss of social benefit). At 15 years left school and at non-qualification among the age groups are both comparative benchmarks for the increased stream of lifetime earnings.

Source: Walker (1991: 22, 23).

Table B2. Percentage of prisoners by sex and age, all Australians, 1991.

Age group	Male	Female	Total
17 years	0.4	0.3	0.4
18 years	2.5	1.9	2.4
19 years	4.1	3.4	4.1
20-24 years	26.4	20.2	26.1
25-29 years	21.7	29.0	22.0
30-34 years	17.1	21.7	17.3
35-39 years	11.7	10.2	11.6
40-44 years	7.0	7.4	7.0
45-49 years	4.3	3.0	4.3
50-54 years	2.6	1.9	2.6
55-59 years	1.2	0.3	1.2
60-64 years	0.7	0.5	0.7
65 years and over	0.4	0.1	0.4
All years	100.0	100.0	100.0

Persons under 17 years go to juvenile centre.

Source: Walker (1991: 18).

Table B3. Number and percentage of prisoners, by sex and known employment status, all Australians, 1991.

Numbers	Male	Female	Total
Employment status			
Employed	2,100	64	2,164
Unemployed	3,927	152	4,079
Home duties	1,013	69	1,082
Student	27	14	41
Other	197	29	226
Unknown	7,029	400	7,429
Total	14,293	728	15,021
Percentage employment status			
Employed	14.7	8.8	14.4
Unemployed	27.5	20.9	27.2
Home duties	7.1	9.5	7.2
Student	0.2	1.9	0.3
Other	1.4	4.0	1.5
Unknown	49.2	54.9	49.5
Total	100.0	100.0	100.0

Source: Walker (1991: 32).

Table B4. Percentage of Indigenous Australians arrested by police in the last five years by age and education, NATSIS 1994.

Years	Als15	Als16	Als17	Als18	Degree	Diploma	Certificate	Non-qual.
Males								
15-19	7.7	4.6	3.5	0.9	0.0	0.0	1.5	0.7
20-24	10.6	9.0	11.4	11.0	0.0	0.0	8.5	13.4
25-29	9.7	9.0	8.1	6.4	0.0	2.3	8.9	7.4
30-34	5.9	8.0	3.0	4.9	12.1	10.7	7.7	6.0
35-39	5.8	2.5	2.2	2.6	0.0	2.1	4.3	5.6
40-44	2.6	2.0	1.2	0.4	0.0	5.0	3.1	0.6
45-49	1.7	0.3	0.3	0.5	0.0	0.0	0.9	0.0
50-54	0.4	0.3	0.1	0.0	0.0	2.7	0.2	0.3
55-59	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0
60-64	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total	44.5	35.8	30.0	26.9	12.1	22.8	35.2	34.0
Females								
15-19	1.6	0.9	0.8	0.7	0.0	0.0	0.7	0.2
20-24	4.4	2.2	4.1	5.2	0.0	2.1	1.7	5.5
25-29	2.8	2.3	1.4	1.8	0.0	1.2	2.3	0.8
30-34	3.0	1.9	1.2	1.3	1.0	0.5	2.1	3.5
35-39	1.8	1.0	0.9	0.6	1.1	0.7	1.3	2.1
40-44	0.6	0.7	0.2	0.4	0.0	0.0	0.3	0.5
45-49	0.0	0.3	0.1	0.0	1.3	0.0	0.0	0.0
50-54	0.1	0.1	0.0	0.2	4.7	0.0	0.1	0.0
55-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60-64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	14.3	9.4	8.7	10.1	8.2	4.5	8.6	12.5

Source: NATSIS 1995.

Table C2. Private rate of return to education without AUSTUDY or ABSTUDY aged 15-64 years, (assuming full income support, adjusting for mean wage growth rates and employment probabilities), 1991.

Aboriginality and sex	Als[1] 15/16 Per cent	Als 15/17 Per cent	Als 15/18 Per cent	Age 17[2] Cert. Per cent	Age 17[3] Dip. Per cent	Age 18-20[4] Degree Per cent	Age 18-21[5,6] Degree Per cent
Females							
(a) Other 64	18.3	13.5	8.8	2.7	11.3	11.6	12.8
(b) Indigenous 44	11.5	11.8	8.5	11.3	21.0	17.5	19.0
(c) Indigenous same as Other	12.6	12.4	7.6	5.7	18.0	15.2	16.3
Males							
(d) Other 64	23.2	16.0	11.5	12.4	15.5	19.0	19.1
(e) Indigenous 46	10.7	11.1	9.5	21.6	23.1	20.2	21.7
(f) Indigenous same as Other	10.7	10.4	8.0	21.0	20.4	19.3	19.4

Table C2. Private rate of return to education with AUSTUDY or ABSTUDY aged 15-64 years, (assuming full income support, adjusting for mean wage growth rates and employment probabilities), 1991.

Aboriginality and sex	Als[1] 15/16 Per cent	Als 15/17 Per cent	Als 15/18 Per cent	Age 17[2] Cert. Per cent	Age 17[3] Dip. Per cent	Age 18-20[4] Degree Per cent	Age 18-21[5,6] Degree Per cent
Females							
(a) Other 64	18.3	19.1	15.4	7.4	20.7	20.2	20.7
(b) Indigenous 44	11.5	21.7	22.8	30.7	48.1	31.9	32.0
(c) Indigenous same as Other	12.6	18.4	15.0	17.2	39.3	26.9	27.1
Males							
(d) Other 64	23.2	20.8	16.8	21.9	25.0	27.8	27.4
(e) Indigenous 46	10.7	18.9	20.5	51.2	46.7	32.4	34.6
(f) Indigenous same as Other	10.7	15.3	14.2	46.4	40.2	31.4	30.6

(a) Other Australian females 64 years for working life expectancy with own employment probability adjustment.
(b) Indigenous females 44 years for working life expectancy with own employment probability adjustment.
(c) Indigenous females same as Other Australian females in terms of employment probabilities.
(d) Other Australian males 64 years for working life expectancy with own employment probability adjustment.
(e) Indigenous males 44 years for working life expectancy with own employment probability adjustment.
(f) Indigenous males same as Other Australians males in terms of employment probabilities.

Notes:

1. Als: Age left school.
2. Assuming a certificate (Cert.) involves two years of full-time study.
3. Assuming a diploma (Dip.) involves two years of full-time study.
4. Assuming a degree (Age18-20/Deg.) involves three years of full-time study.
5. Assuming a degree (Age18-21/Deg.) involves four years of full-time study.
6. Age 18-21/Deg. is under assumption of same proportion additional year income increased and full employment probability. The rate of return for Age 18-21/Deg. will be less than that for Age 18-20/Deg. if no assumption of full employment probability.

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