New Estimates of the Private Rate of Return to University Education in Australia*

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Abstract

The objective of this study is to provide new estimates of the average private rate of return to a university degree in Australia. It considers the case of a hypothetical individual who has completed high school in 2000, and is making a decision on whether to begin a three-year bachelor degree or to enter the workforce in 2001. For the 'base case' scenario of a 'representative' individual making a decision on whether to attend university, the estimate of the average private rate of return to a three-year bachelor degree is 14.5 per cent. Underlying this estimate is a lifetime net monetary gain of $380,958 from undertaking the degree (assuming a zero rate of discount). Estimates of the rate of return to a bachelor degree are fairly robust to alternative scenarios. Rates of return do however show a wide variation across the field of qualification categories. The estimated returns are relatively high for business and administration, and engineering graduates, and relatively low for graduates in the fields of society and culture, and science.

Executive summary

1. The objective of this study is to provide new estimates of the average private rate of return to a university degree in Australia. It considers the case of a hypothetical individual who has completed high school in 2000, and is making a decision on whether to begin a three-year bachelor degree or to enter the workforce in 2001. First, an estimate of the private rate of return is calculated for a particular set of assumptions on the monetary benefits and costs of undertaking a bachelor degree. Second, sensitivity analysis is undertaken to check the robustness of estimates of the rate of return to changes to key assumptions. Third, estimates of the rate of return are made for disaggregated groups – for example, by field of qualification.

2. The 'base case' scenario is intended to represent the environment for an 'average' or 'representative' individual making a decision on whether to attend university. For this case the estimate of the average private rate of return to a three-year bachelor degree is 14.5 per cent. Underlying this estimate is a lifetime net monetary gain of $380,958 from undertaking the degree (assuming a zero rate of discount). Costs of undertaking the degree from foregone earnings and direct expenses and fees are estimated to be $52,563, and the increase in earnings following graduation with a bachelor degree is $433,521.

3. Sensitivity analysis finds that estimates of the rate of return to a bachelor degree are fairly robust to alternative scenarios. Use of alternative earnings data, using alternative ways of modelling differences in employment outcomes between high school and university graduates, assuming different retirement ages, or different HECS repayment bands or payment method, do not have a large effect on estimates of the rate of return. However, use of an earnings series that controls for differences in occupation and industry composition of employment between high school and university graduates, setting equal annual work time of high school and university graduates, increasing the time taken to complete a three-year degree, and a higher level of direct costs, all have a greater effect.

4. Analysis of the rate of return for disaggregated workforce groups is undertaken in a variety of ways:

a) By level of qualification – The rate of return to a postgraduate degree (conditional on having completed an undergraduate degree) is estimated to be 6.5 per cent. This is lower than the return to an undergraduate degree but, given the degree of heterogeneity in the length and type of postgraduate programs, this finding needs to be interpreted with caution.
b) By field of qualification - Rates of return show a wide variation across the field of qualification categories. The estimated returns are relatively high for business and administration, and engineering graduates, and relatively low for graduates in the fields of society and culture, and science.
c) By position of a university graduate in the earnings distribution for university graduates - Rates of return are found to vary widely by the position of a university graduate in the distribution of earnings. For an individual who has

earnings at the 25th percentile the rate of return is not defined; and assuming a four per cent rate of discount the net benefit is -$83,585. For individuals at the 50th (median) and 75th percentiles (respectively) the rates of return are 11.0 and 22.5 per cent. In interpreting these findings it is important to bear in mind that the estimates do not include non-pecuniary benefits of university participation; and that the assumed counter-factual – average earnings of a high school graduate – may not be the appropriate counter-factual for university graduates with below median earnings.

5. The estimates of the average private rate of return to a bachelor degree from this study are compared with similar estimates from other recent studies. The estimate of the rate of return in this study is found to be very close to that obtained from two other studies that also used earnings data from the 1990s. However, estimates of rates of return from the post-HECS period (such as this study) are uniformly lower than from studies undertaken in the pre-HECS period. Removing the HECS payment from the base case in this study gives an average private rate of return of 18.5 per cent. Hence it is concluded that most of the difference between estimates of the private rate of return in studies undertaken in the pre-HECS and post-HECS periods is due to the introduction of HECS.

1. Introduction

Estimates of the rate of return to a university degree provide one measure of the net monetary benefits from higher education. Information on the rate of return can be useful for understanding individuals' decisions on whether to attend university and overall trends in participation in university education; and it can also provide policy-makers with a measure of the value of providing extra funds to higher education relative to other types of government expenditure.

The main objective of this paper is to provide new estimates of the average rate of return to university education in Australia. The paper focuses on the private rate of return – that is, on the costs and benefits of university education to the individual undertaking the education. In a previous paper in this series (Borland et al., 2000) some preliminary estimates were made of the average rate of return to university education in Australia. Here, that analysis is extended in two main ways. First, sensitivity analysis on calculations of the average private rate of return to university education is undertaken. This involves checking how estimates of the rate of return vary with key assumptions used to calculate the rate of return. Second, estimates of the average private rate of return are made for disaggregated workforce groups – by level of university qualification; by field of university qualification; and by level of earnings.

In section 2 details of the methodology used to calculate the rate of return are presented. Section 3 presents the main findings on the rate of return. In Section 4 comparisons are made between the findings from this study and other recent studies of the rate of return to university education in Australia.

Some general comments on the scope of this study are necessary. First, the study is restricted to making estimates of the private rate of return. The issue of the social rate of return – encompassing the costs and benefits of university education for society - is considered in Johnson and Wilkins (2002). Second, the study makes estimates of the rate of return to university education only for males. The reason for this restriction is the difficulty of characterising the age-earnings

profiles of female workers using available cross-section data sets. Third, results on rates of return in this study represent an average return for all individuals in the population who have completed university education. For some policy decisions – such as making a decision on the returns from expanding the number of admissions to higher education - this may not be exactly the appropriate measure of rate of return.

2. Methodology for calculating the rate of return to university education

a. Introduction

Undertaking education is an investment. A decision to 'purchase' extra education incurs costs at the time the education is undertaken, and subsequently upon entry to the workforce, a stream of future benefits. The internal rate of return is a summary statistic that can be used to measure the net benefit of undertaking a university education – that is, the relative magnitude of costs and benefits. Formally, it is the rate of interest that equates the present discounted value of the costs and benefits from making the investment.

The calculation of the rate of return to university education that is undertaken in this paper involves the following experiment – It considers the case of a single individual who has completed high school in 2000 and is making a decision on whether to undertake a three year bachelor-level degree or to enter the workforce in 2001. For this case the rate of return is expressed as:

$$\sum_{t=1}^{n} C_t/(1+r)^t - \sum_{t=n+1}^{m} B_t/(1+r)^t = 0 \qquad (1)$$

where: C_t = opportunity costs of university degree in year t;

B_t = benefit of university degree in year t;

n = length of education;

m – n = years in workforce; and

r = rate of return.

(In this expression for the rate of return it is assumed that all costs are incurred in years 1 to n, and benefits accrue between years n and m. For the experiment in this paper Year 1 = 2001, Year n = 2003, and Year m = 2064)

A range of types of benefits and costs are associated with the decision to undertake a university bachelor degree. From the perspective of an individual making a private decision about whether to undertake a university degree a primary source of costs and benefits relates to labour market activity. During the period of study an individual is likely to forego some labour market earnings, but following the investment, the higher level of educational attainment should mean that the individual has higher earnings than without a degree. Acquiring a university degree may also increase an individual's probability of employment (or weeks of employment each year). Other costs and benefits are more direct – fees paid to undertake the degree, and the monetary cost of student amenities fees, textbooks and transport costs, which may be offset to some degree by government benefits for students (for example, Youth Allowance or ABSTUDY).

b. 'Base case'

In order to calculate the rate of return to a university degree it is necessary to be more precise about how to calculate costs and benefits, and to make some assumptions about future outcomes for an individual who has completed high school for the scenarios where that individual does and does not choose to acquire a university degree.

The approach in this study is to begin by specifying a 'base case' set of assumptions. These assumptions constitute one possible environment in which an individual would be making a decision on whether to attend university. The base case assumptions are intended to represent the environment for an 'average' or 'representative' individual. (The 'base case' assumptions are very similar to those used in the earlier paper in this series – Borland et al., 2000.) The rate of return is first estimated for the base case. In the rest of the analysis, estimates of the rate of return for scenarios that depart from the base case set of assumptions are made.

The set of 'base case' assumptions are:

1. Weekly earnings for high school graduate and university graduate –

Measures of average weekly earnings for an individual who had completed high school or who has a bachelor degree or above are derived from the ABS 1997 Training and Education Experience Survey (TEES). The sample used to obtain the estimates is male wage and salary earners aged 15-64 years working part-time or full-time. Average usual weekly earnings in job with main period employer are calculated for disaggregated age workforce groups - 18, 19, 20, 21, 22, 23, 24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54 and 55-59 years.

It is assumed that age-earnings or experience-earnings profiles derived using the 1997 ABS TEES data apply over the future time period encompassed in this study. Real earnings growth for both high school and university graduates is assumed to be 2 per cent per annum.

The weekly earnings variable in the TEES is classified into 29 categories. For the upper category of $1160 and above an estimate of average weekly earnings is made for high school and university graduates using data from the ABS 1996/97 Income Distribution Survey (IDS). (The IDS provides earnings on a continuous scale. Details of the estimation method are available on request from the author.) For all other categories weekly earnings are set equal to the mid-point of the category.

2. Making an estimate of annual earnings

An estimate of annual earnings for high school and university graduates is made by multiplying weekly earnings for each age category/education group by 52 by the proportion of persons in the respective education group who are employed out of all labour force participants in that group. For example, suppose weekly earnings of university graduates aged 25-29 years are $1000 per week, and that 50 per cent of university graduates in the labour force in that age group are employed. Then estimated annual earnings for the age/education group are equal

to $1000 by 52 by 0.5 which equals $26,000. This approach assumes that high school and university graduates will be in the labour force in every year after graduation (until retirement) but may not be employed at every point in time.

3. Annual post-tax earnings

Annual post-tax earnings are estimated by adjusting annual earnings using the following marginal tax rates: $0 to $6000 – 0%; $6001 to $20,000 – 17%; $20,001 to $50,000 – 30%; $50,001 to $60,000 – 42%; and above $60,001 – 47%. It is assumed that these tax rates apply throughout the period encompassed by the study. (By allowing for growth in real income over time, but not making adjustment to the threshold values for the different marginal tax rates, there will be significant 'bracket creep' over time.)

To the extent that high school and university graduates spend different proportions of their income on goods and services that involve a GST payment, it might be appropriate to also adjust earnings for indirect tax payments. However, data for making such an adjustment are not available.

4. Annual post-tax earnings while undertaking university degree

Weekly earnings during the period undertaking the university degree are calculated from the ABS TEES 1997 as average weekly earnings for full-time male university students in disaggregated age groups - 18, 19, 20, 21, 22, 23 and 24 years. (Only earnings for 18, 19 and 20 year olds are relevant for the three year undergraduate degree that is examined in the base case.) It is assumed that each student works for 40 weeks in the year. Post-tax earnings are estimated using the same marginal tax rates as above.

5. Time taken to complete university degree

It is assumed that an individual who is a university graduate undertakes a three year bachelor degree that is completed in three years.

6. Retirement age

It is assumed that both high school and university graduates retire at age 65. No account is taken of differences in income between high school and university graduates after the age of retirement.

7. HECS payment

It is assumed that participation in university education requires payment of the Band 2 amount ($5015 per annum), and that this amount is paid up-front. (Appendix 1 lists course areas covered by each payment band.)

8. Direct costs

It is assumed that direct costs are $2000 per annum. Direct costs include student amenities fees, books, and travel.

9. Government benefits

It is assumed that the student does not receive any benefit payments such as the Youth Allowance.

c. Sensitivity analysis

The sensitivity analysis that is undertaken varies the base case assumptions described above in a variety of ways:

1. Estimation of average weekly earnings

Several alternative methods are used to estimate average weekly earnings of high school and university graduates. First, predicted weekly earnings for high school and university graduates derived from regression equations for individual weekly earnings using the ABS TEES 1997 are used. Second, predicted weekly earnings for high school and university graduates derived from regression equations for

individual weekly earnings using pooled data from the ABS 1986 and 1990 Income Distribution Surveys, and the ABS TEES 1993 and TEES 1997 are applied. (More details on the methodologies used to derive the predicted earnings series are presented in Appendix 2.) Third, for both methods of generating predicted weekly earnings, hypothetical weekly age-earnings profiles are calculated for the scenario where both high school and university graduates work 40 hours per week.

The objective with the first set of substitute earnings series is to examine the effect of controlling for other determinants of earnings apart from education attainment – such as occupation and industry status. Estimates of the rate of return to university education in the base case – that use data on the average weekly earnings of high school and university graduates – implicitly attribute the whole difference in earnings between those groups to the effect of education. However, it is possible that part of the difference in earnings between the groups is due to the effects of other explanatory factors for earnings – such as occupation – that are correlated with education attainment. Of course, it could also be argued that it is education attainment that causes differences in those other explanatory factors – for example, education attainment is the reason why more people with university degrees are professionals than are high school graduates. What this discussion suggests is that estimates of the rate of return using data on average weekly earnings are an upper bound (at least with respect to choice of earnings measures) on the 'true' rate of return; on the other hand, estimates that used predicted earnings derived from regression equations that control for other explanatory factors for earnings are likely to represent a lower bound on the 'true' rate of return.

The objective with the second set of substitute earnings series is to examine the effect of controlling for possible 'cohort' effects on earnings. Using cross-section data to make predictions on lifetime earnings profiles can be subject to error if age-earnings profiles are changing over time. By using data from several cross-section surveys it is possible to make estimates of the age-earnings profiles for high school and university graduates that do not confound the effects of changes in earnings between age cohorts or business cycle effects.

The rationale for the third type of adjustment to the weekly earnings series is to examine the extent to which differences in weekly earnings between high school and university graduates (and hence the rate of return to a university education) are related to differences in wage rates or to differences in weekly hours of work. Where the difference in weekly earnings is primarily due to higher weekly hours of work of university graduates than high school graduates it might be argued that the rate of return measure should incorporate a correction for the smaller number of leisure hours consumed by university than high school graduates (for example, Lindsay, 1973). Holding constant weekly hours of work is one way of making this type of adjustment.

2. Method of estimating annual earnings

An alternative assumption is that annual earnings for each age/education group are equal to weekly earnings of that group multiplied by 52 by the proportion of a respective education group that is employed out of the whole population in that education group. From the perspective of calculating the private rate of return to university education, the base case assumption is appropriate where it is assumed that, at the time of deciding on whether to undertake university education, individuals believe that they will be in the labour force in every year until retirement. The alternative assumption is appropriate where, at the time of deciding on whether to undertake university education, individuals believe that they are likely to have on average the same labour force participation experience as the whole population of high school and university graduates.

3. Age of retirement

Alternative assumptions on age at retirement – specifically, 55 and 60 years – are be examined.

4. Time taken to complete university degree

Alternative assumptions on time taken to complete the university degree can be examined – for example, four years to complete a three year degree. This can be done by assuming that a student who takes four years to complete spends an extra year studying, and then on completion, has the same earnings as an individual who took three years to complete the degree, or that the individual would have the same earnings as an individual who took three years to complete had in the previous year. (These alternatives encompass the possibilities that the only disadvantage to slow completion is time out of the workforce, and that the disadvantage is time out of the workforce and a lower age-earnings profile.)

Another issue is the return to completing four or five year degrees. Clearly, this is an important issue given the increasing proportions of students undertaking four year degrees, and undertaking joint degrees that will take five or six years to complete. Given that the differences between three year and other length degrees are likely to be substantial (for example, pass versus honours, and single degree versus joint degree), sensitivity analysis on the effects of alternative degree lengths would need to incorporate differences in age-earnings profiles between individuals with different length degrees. Unfortunately, the available data do not allow calculation of weekly earnings separately for individuals who have completed different length degrees. Hence, this type of sensitivity analysis is not attempted in this paper.

5. Real earnings growth

Alternative assumptions on the rate of growth in real earnings – for example, 1 per cent and 3 per cent – are considered.

6. HECS payments

The effect of changing the assumed payment to Band 1 ($3,521) or Band 3 ($5,870) is examined, and also the effect of deferred payment (using repayment rates and earnings thresholds for 2000-01 – See Appendix 1).

7. Direct costs

Alternative assumptions on the size of direct costs are made. A lower amount of costs of $1500 is considered, along with a larger amount of $7,000. (The larger amount might incorporate cost of accommodation for a student for whom it is necessary to live away from home. Note that there is an implicit assumption that the accommodation cost would not be incurred if the individual chose to not undertake university education.)

d. Disaggregated analysis

The disaggregated analysis that is undertaken provides estimates of the private rate of return to a university degree for different types of university graduates:

1. Disaggregation by level of qualification

In the base case the measure of earnings for university graduates is derived from the sample of all persons with a bachelor degree or higher. In the disaggregated analysis the rate of return to obtaining a bachelor degree only (compared to high school completion), the rate of return to obtaining a higher degree (compared to bachelor degree), and the rate of return to obtaining bachelor and postgraduate degree (compared to high school completion) are estimated. (This analysis will reveal the extent to which the base case estimates of the rate of return to a university undergraduate degree may have been biased by including individuals with postgraduate degrees in the sample from which earnings measures are derived.)

In this exercise it is assumed that completion of a postgraduate degree involves three years of extra study. This is in addition to the three years required to complete an undergraduate degree. It is assumed that the three years of postgraduate study involve the same direct costs as for undergraduate study, but that no extra HECS costs are incurred. Earnings from labour market activity are estimated separately for individuals who complete only a bachelor degree, and for individuals who complete both bachelor and postgraduate degrees. Finally, it is assumed that the degree program is completed in three years.

2. Disaggregation by field of qualification

Rates of return will be calculated for individuals with university degrees – disaggregated by main field of qualification: Business and administration; Society and culture; Science; Engineering; and Education.

The categories for main field of qualification are from the ABS TEES 1993 and TEES 1997. For this part of the analysis it was necessary to merge data from both sources in order to obtain a sufficient number of observations in each field of qualification. Unfortunately the categories differ somewhat from the way that degree programs are organised in most universities. For example, arts is not identified as a separate degree program in the categories; and commerce is divided between the categories business and administration, and society and culture. While the more usual categories were also used in the TEES 1993, that one survey does not provide a sufficient number of observations to undertake the disaggregated analysis. Table 1 shows the relation between the field of study categories used in this study and the more usual categories. For the analysis of rates of return undertaken in this study, attention is restricted to fields of qualification where more than 100 observations were available from the pooled surveys for 1993 and 1997.

In this exercise it is assumed that an undergraduate degree in each field of qualification area takes three years to complete, but the HECS payment amount is varied according to its Band classification (see Appendix 1). Age-earnings

profiles are derived separately for each field of qualification category. Other assumptions are the same as for the base case.

3. Disaggregation by level of earnings

Rates of return are calculated for university graduates with weekly earnings at different points of the distribution of earnings (in each disaggregated age group). Specifically, the rates of return for university graduates at the 25th, 50th and 75th percentiles of the distribution of weekly earnings in each age group, are estimated.

e. Discussion of methodology

Before proceeding to present a summary of the findings on estimates of the rate of return to acquiring a university degree, it is useful to make some general points that affect interpretation of the findings.

First, the approach in this study is primarily to treat differences in earnings between high school and university graduates as being causally related to the difference in education attainment between those groups. (The only caveat is the sensitivity analysis using predicted earnings from regression analysis that controls for other explanatory factors for earnings.) This may over-state the 'true' increase in labour market earnings from acquiring a university degree - for example, because it tends to be individuals with higher general intellectual ability who acquire university degrees. (However, empirical analysis of whether controlling for selection effects causes lower estimates of the return to education has reached mixed findings – see Borland et al., 2000, Appendix 1.)

Second, the method of calculation of the rate of return to a university degree that is followed in this study is a 'partial equilibrium' exercise. That is, it is assumed that if one extra individual chooses to acquire a university education rather than leaving education after high school completion, this will not affect either the costs or returns to acquiring a university degree. For example, with one extra individual with a university degree, it is assumed that the relative earnings of workers with university degrees compared to workers whose highest education if

high school completion are not changed. If instead of examining the return to an extra individual acquiring a university degree, what was being considered was the return from switching a large group in the population from high school completion to having university degree, the assumptions made in the partial equilibrium approach may not be valid. In that case, it might be better to adopt a 'general equilibrium' approach that would, for example, take into account possible effects on relative earnings by education attainment of the increase in the proportion of workers with university degrees.

Third, the measures of earnings for university and high school graduates are derived from samples of wage and salary earners. Hence, the earnings measures do not incorporate information on earnings of the self-employed. A significant fraction of the earnings of self-employed workers may be a return to capital assets such as plant or equipment. Hence, to obtain an estimate of the rate of return that is based primarily on returns to labour input, self-employed workers are excluded. For the overall sample of workers this exclusion probably does not have a significant effect on the estimated rate of return to a university degree. (In August 2000 approximately 16.5 per cent of the male workforce were either employers or own account workers – ABS, Labour Force Australia, August 2000, Table 42.) However, for particular groups of workers where a large proportion are self-employed - such as lawyers or doctors - there might be considerable bias. (On this issue, see Wilson, 1987.)

3. Results

a. Monetary costs and benefits

A summary of the average private monetary benefits and costs of a three year bachelor degree are presented in Table 2. That table shows – for example – in the case where adjustment is made for employment effects, and a zero discount rate is assumed, that an individual undertaking a university degree would incur costs from foregone earnings while studying of $26,133, costs from fees and direct

expenses of $21,045, and would gain $450,901 in lifetime earnings post-graduation. In this case the net lifetime benefit is therefore $403,723.

For the case where no adjustment is made for differences in employment outcomes between high school and university graduates the net monetary benefit is slightly lower. And not surprisingly, introducing a positive discount rate lowers significantly the net benefit. In the case with adjustment for employment differences the net benefit is $145,638.

These findings for the base case scenario are quite close to those obtained in the previous preliminary work on estimating the rate of return to university education (Borland et al., 2000). In that work the lifetime gain for the case with a 4 per cent discount rate and adjustment for employment effects of education was $90,433. The difference appears to be mainly due to differences between the methods for estimating weekly earnings (for example, exclusion of self-employed workers in this study), and in assumed retirement age (equal to 65 years in this study compared to 60 years in the previous study).

b. Average private rate of return – Base case and sensitivity analysis

Table 3 presents estimates of the average private rate of return for undertaking a three year university undergraduate degree. (As well, the net lifetime monetary benefit assuming a four per cent discount rate is shown.) Estimates are shown for the base case, and for the alternative scenarios that are used to test the robustness of the base case findings.

For the base case the estimate of the average private rate of return is 14.5 per cent. In general, it is found that estimates of the rate of return are fairly robust to alternative scenarios. Use of earnings data that control for cohort effects, alternative adjustments for employment effects, assuming different retirement ages, or different HECS repayment bands or payment method, do not have a large effect on estimates of the rate of return. However, use of an earnings series that controls for differences in occupation and industry composition of employment between education groups, changes to assumptions on hours of work, on the time

taken to complete a three-year degree, and on direct costs, all have a greater effect.

Controlling for differences in the occupation and industry composition of employment between high school and university graduates reduces the rate of return to 10.0 per cent. As has been described, controlling for occupation and industry status introduces an assumption that education attainment does not affect occupation or industry status. To the extent that this is not correct then the estimate should be thought of as a lower bound on the return to university education. (This is a lower bound holding all other assumptions constant.) Equivalently, if it is not the case that the only factor that determines occupation and industry status is education attainment, then 14.5 per cent is an upper bound on the return to university education.

Adjustments to assumptions on differences in work time between high school and university graduates also have a sizeable effect on estimates of the rate of return. Introducing the assumption that a high school or university graduate will work the same hours per week (40) lowers the estimate of the rate of return by about four percentage points. And adding to this scenario the assumption that each type of graduate works 52 weeks per year further reduces the rate of return by about two to three percentage points. For the case where weekly earnings are predicted using the regression method with extra explanatory variables the effect of holding constant weekly hours of work and weeks of work per year is to reduce the rate of return to a bachelor degree to 4.0 per cent.

Not completing a degree program in the minimum time and a higher level of direct costs are further factors that are associated with a reduction in the rate of return to a university degree. Where the only cost of a one year delay in completion is from that year of foregone earnings the rate of return falls to 11.5 per cent. And where there is an additional cost of a shift down in the age-earnings profile so that the university graduate each year receives what they would have earned in the previous year had they completed in the minimum time, the rate is only 9.5 per cent. An increase in the direct cost of acquiring a university degree from $2000 to $7000 lowers the rate of return to 12.0 per cent. Both of these

factors – delay in completion and an increase in direct costs – have relatively large effects on the rate of return because they occur in early time periods.

c. Average private rate of return – Disaggregated findings

Estimates of the rate of return to a university degree – by level of qualification, for disaggregated field of qualification groups, and for individuals at different percentiles of the distribution of earnings for university graduates – are presented in Table 4.

The rate of return to a three year bachelor degree for individuals who complete only a bachelor degree is 13.5 per cent. This shows that – whether the rate of return to a bachelor degree is calculated using earnings data for individuals who complete only a bachelor degree, or who complete a bachelor and some postgraduate degree – does not have a significant effect on the estimated rate of return. (To the extent that there is a difference, earnings of individuals with a bachelor and postgraduate degree are revealed to be slightly higher than for individuals with just a bachelor degree.)

The rate of return to completing a postgraduate degree having already completed an undergraduate degree is estimated to be 6.5 per cent. This estimate should be interpreted with caution as – given the heterogeneity in the length and type of postgraduate degree programs - there is likely to be significant variability around this average estimate for particular postgraduate degree programs. (For example, consider the difference between a one-year postgraduate diploma, a two –year MBA, and a Ph.D that might take five to six years.)

The rate of return to completing both a bachelor degree and postgraduate degree – compared to completing schooling after high school – is estimated to be 8.0 per cent. As would be expected, this return is between the estimate for completing just a undergraduate degree or postgraduate degree. The some cautionary remarks about interpretation apply.

Rates of return show a wide variation across the field of qualification categories. The estimated returns are relatively high for business and administration, and engineering graduates, and relatively low for graduates in the fields of society and culture, and science. One caveat to these findings is however that it has been assumed that all degree programs are for three years. Where programs are unlikely to be three years (for example, perhaps engineering) this will cause upward bias in the estimate of the rate of return.

Rates of return are found to vary widely by the position of a university graduate in the distribution of earnings. For an individual who has earnings at the 25th percentile the rate of return is not defined; and assuming a four per cent rate of discount the net benefit is -$83,585. For individuals at the 50th and 75th percentiles (respectively) the rates of return are 11.0 and 22.5 per cent. (That the rate of return at median earnings is below the rate of return at mean earnings shows that mean earnings are higher than median earnings. This is a common property of earnings distributions.)

On a narrow interpretation the findings on returns for university graduates at different points of the distribution of earnings suggest that a relatively large group obtain a negative return from higher education participation. However, it is important to bear in mind two points. First, the measure of net benefit includes only monetary costs and returns. Hence, it does not include what may be a substantial nonpecuniary benefit from attendance at university and obtaining a bachelor degree. Second, the comparison is with a high school graduate with average earnings. The selection process into education is likely to be such that an individual at the 25th percentile of the earnings distribution for university graduates would also have below-median earnings if that individual had finished education at high school graduation. Hence, the method is over-estimating the earnings that a university graduate with below-median earnings could have earned as a high school graduate, and therefore under-estimating the rate of return to a university degree for that individual.

4. Comparison with other studies

A range of studies of the rate of return to university education have been undertaken for Australia. In an earlier paper (Borland et al., 2000) an extensive review of those studies has been provided. Here, the results from this study are compared with findings from the main recent studies.

Table 5 shows estimates of the average private rate of return to a university degree from this study, and a set of other recent studies that apply similar methods. Two main points stand out from the findings that are summarised in the table. First, the estimate of the rate of return in this study is very close to that obtained from two other studies that also used earnings data from the 1990s. One other study from the 1990s by Chapman and Salvage (1997) however obtained estimates of the rate of return that are quite a bit lower than in this study. The difference in findings between this study and Chapman and Salvage appears to relate primarily to a difference in assumptions on earnings of individuals undertaking a university degree. Second, estimates of rates of return from the post-HECS period are uniformly lower than the Miller (1982) estimate from the pre-HECS period. Removing the HECS payment from the base case in this study gives a rate of return of 20.5 per cent. Hence it can be concluded that most of the difference between the pre-HECS and post-HECS studies is due to the introduction of HECS. (The remainder is probably due to a declining earnings differential between university and high school graduates between the 1970s and 1990s – see Borland, 1996.)

The methodology applied in the other studies is generally very similar to what is done in this study. One exception however is the study of Johnson and Lloyd (2000) that uses the NATSEM RED model. This model uses microsimulation methods. With this method the rate of return to university education is predicted for all individuals in a population. To obtain an estimate of the average rate of return using this approach the average rate of return across all individuals in the population is calculated. This differs from the approach in this study where a single rate of return – for a hypothetical average university graduate – is

estimated. The RED model is also more sophisticated than the approach taken in this study in the range of factors that are assumed to affect the rate of return. Specifically, superannuation payments and receipt are incorporated, the time horizon is extended to a post-retirement phase with death assumed to occur at 75 years, and transfer payments from the government are incorporated.

Through the flexibility of the microsimulation approach, and the range of factors that can be modelled as determinants of the rate of return to university education, the RED model has some advantages over the more standard approach used in this study. However, it is also important to mention some shortcomings of the method. First, the amount of flexibility that is introduced by microsimulation would seem to have significant limits. Generally policy-makers will be most interested in prospective estimates of the rate of return to university education – that is, for future cohorts of students. This means that it is then necessary to define what will be the population of students and to forecast their age-earnings profiles. But in forecasting age-earnings profiles probably the best that can be done is to disaggregate by field of qualification and to attribute the average earnings for that qualification to each individual completing a degree in that area of study. But this means that the estimate of the rate of return to university education from the microsimulation method is really just a weighted average of the rate of return for field of qualification categories. Second, the way that labour market participation is treated in the RED model is quite restrictive. One issue is that it is assumed that university students do not participate in the labour market while studying. This is clearly at odds with actual experience, and it seems important, as is done in this study, to incorporate labour market earnings while studying into an estimate of the costs of study. (This is particularly significant given that it occurs at the start of the time horizon over which the rate of return is estimated.) Another issue is that participation in the post-study period is restricted to being full-time employment, part-time employment, or not employed for both high school and university graduates. This seems somewhat restrictive when it is possible, as is done in this study, to allow for differences in average weeks or hours worked on a continuous scale.

Table 1: Field of study frequencies – Australian-born wage and salary workers – 1993

	Business and Admin.	**Health**	**Educ-ation.**	**Society and Culture**	**Natural and Physical Sciences**	**Engin-eering**	**Arch. and Building**	**Agric. Studies**	**Other**	**Total**
Administration, Business studies and commerce	111			33						144
Law				19						19
Education			129							129
Medicine		46								46
Science and maths					93					93
Computer and information sciences					33					33
Veterinary science, Agriculture and Forestry		2						16		18
Engineering						62				62
Architecture						5	12			17
Social sciences, Arts and Humanities				80						80
Other									13	13
Total	111	48	129	132	126	67	12	16	13	654

Source: ABS, Survey of Training and Education Experience 1993, unit record file.

Table 2: Private monetary costs and benefits of a 3-year university degree – Australian-born male wage and salary workers

	(a) No employment adjustment		**(b) Employment adjustment**	
	Total ($)	**Annual ($)**	**Total ($)**	**Annual ($)**
A. Zero rate of discount				
Age 18-20:				
Foregone earnings	31,158		26,133	
Cost of fees and direct costs	21,045		21,045	
Total cost	52,563	17,521	47,178	15,726
Age 21-65:				
Increase in earnings	433,521	9,634	450,901	10,020
Total lifetime gain	380,958		403,723	
B. Rate of discount – 4 per cent				
Age 18-20:				
Foregone earnings	28,958		23,985	
Cost of fees and direct costs	19,504		19,504	
Total cost	48,462	16,154	43,489	14,496
Age 21-65:				
Increase in earnings	178,540	3,968	189,127	4,203
Total lifetime gain	130,078		145,638	

Table 3: Average private rate of return to 3-year university degree – Australian-born male wage and salary workers

	Average private rate of return (%)	**Net lifetime gain (4% rate of discount) ($)**
A. Base case	14.5	145,638
B. Regression adjusted earnings		
1. With extra explanatory variables		
Variable hours	10.0	44,978
Fixed hours	5.5	19,316
Fixed hours and no employment adjustment	4.0	4,831
2. With cohort effects		
Variable hours	14.0	133,621
Fixed hours	10.5	100,641
Fixed hours and no employment adjustment	8.5	87,412
C. Alternative adjustment for employment effects		
Zero adjustment	12.5	130,078
EMP/POP adjustment	15.0	170,258
D. Retirement Age		
55 years	14.5	137,744
60 years	14.5	162,567
E. Time taken to complete 3 year degree		
Take 4 years – Only cost time out of work	11.5	122,372
Take 4 years – Cost time out of work and shift down in age-earnings profile	9.5	107,199

F. HECS repayments		
Band 1	15.5	149,784
Band 3	14.0	143,265
Deferred payment	17.0	148,751
Zero HECS	18.5	159,555
G. Direct costs		
$1500	15.0	147,026
$7000	12.0	131,763

Table 4: Average private rate of return to university degree – Australian-born male wage and salary workers – Disaggregated results

	Average private rate of return (%)	**Net lifetime gain (4% rate of discount) ($)**
A. Base case	14.5	145,638
B. By level of qualification		
Bachelor degree (cf. CHS)	13.5	114,878
Bachelor degree + Postgraduate degree (cf. CHS)	8.0	85,550
Postgraduate degree (cf. Bachelor degree)	6.5	29,896
C. By field of qualification		
Business and Administration	18.0	231,014
Society and culture	11.0	83,774
Science	11.0	132,801
Engineering	19.5	310,257
D. By percentile in earnings distribution for university graduates		
25th percentile	Not defined	-83,585
50th percentile	11.0	64,827
75th percentile	22.5	416,528

Table 5: Comparisons of estimates of rate of return to university degree – Australia

Study	Year of data	Private rate of return (%)	Social rate of return (%)
Miller (1982)	1976	21.1	16.3
Maglen (1994)	1989/90	13.5	
Chapman and Salvage (1997)	1996	9.4	
Johnson and Lloyd (2000)	1994-95	13.4	9.9
This study – 3 year degree	1997 (Adjusted to 2001)	14.5	

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Appendix 1 – HECS payments

A. Full-time Full-year contributions – 2001

Band 1: ($3521) – Arts, Humanities, Social Studies/Behavioural Sciences, Education, Visual/Performing Arts, Nursing, Justice and Legal Studies.

Band 2: ($5015) – Mathematics, Computing, Other Health Sciences, Agriculture/Renewable Resources, Built Environment/Architecture, Sciences, Engineering/Processing, Administration, Business and Economics.

Band 3 ($5870) – Law, Medicine, Medical Science, Dentistry, Dental Sciences and Veterinary Science.

B. HECS repayments 2000-01

HECS repayment income is the taxable income for an income year; plus any amount that taxable income has been reduced by a net rental loss; plus total reportable fringe benefits.

The income thresholds and repayment rates for income earned are:

Below $22,346	Nil
$22,346-$23,565	3.0%
$23,566-$25,393	3.5%
$25,394-$29,456	4.0%
$29,457-$35,551	4.5%
$35,552-$37,420	5.0%
$37,421-$40,223	5.5%
$40,224 and above	6.0%

[For HECS repayment – Percentage rate to be applied to HECS income in the range of repayment income]

Source: http://www.hecs.gov.au/pubs/hecs2001 on 12/19/00 at 3.50pm.

Appendix 2 – Calculation of predicted age-weekly earnings profiles using regression methods

a. Controlling for other explanatory variables

A regression equation for log weekly earnings in main job of native-born male wage and salary earners aged 15-64 years is estimated using data from the ABS 1997 TEES:

$$w_i = \beta X_i + \varepsilon_i$$

where w_i is log weekly earnings of the ith individual in the sample, and X_i is a vector of demographic and job characteristics – specifically, education attainment (dummy variable for bachelor degree or above), a cubic in potential experience, occupation in main job (eight dummy variables), and industry in main job (twelve dummy variables). Note that the sample is restricted to wage and salary earners with highest level of education attainment of high school completion or bachelor degree or above. Data are weighted using sample weights from the TEES.

A predicted age-weekly earnings profile is calculated for each education attainment group at each age (using the coefficient estimates on education and experience from the regression analysis allowing the values of potential experience and education attainment to vary). The effect of occupation and industry on predicted earnings is equal to the weighted average of the estimated effects from the regression analysis, using as weights the share of the total workforce in each occupation and industry group. (That is, for both high school and university graduates the same weights are used, and hence each group is attributed the same occupation and industry effect on weekly earnings.)

b. Controlling for cohort effects

A regression equation for log weekly earnings in main job of native-born male wage and salary earners aged 15-64 years is estimated using data from the ABS IDS for 1986 and 1990, and the ABS TEES for 1993 and 1997:

$$w_{it} = \beta X_i + \gamma Y_i + \delta UE_t + \varepsilon_i$$

where w_{it} is log weekly earnings of the ith individual in sample year t, X_i is a vector of demographic characteristics – specifically, education attainment (dummy variable for bachelor degree or above), a cubic in potential experience, Y_i is a set of ten dummy variables for the year of labour market entry of the ith individual, and UE_t is the rate of unemployment in sample year t. In this specification identification of experience, year of labour market entry, and year effects is achieved through the parameterisation of the year effect as being associated solely with variation in the rate of unemployment (see Deaton, 1997, pp.123-127). Note that the sample is restricted to wage and salary earners with

highest level of education attainment of high school completion or bachelor degree or above. Data are weighted using sample weights from the IDS and TEES.

A predicted age-weekly earnings profile is calculated for each education attainment group at each age (using the coefficient estimates on education and experience from the regression analysis allowing the values of potential experience and education attainment to vary). The effect of year of labour market entry is controlled for by attributing the average effect to weekly earnings (that is, the average of the coefficient estimates on each year of labour market entry dummy variable). The effect of year effects is incorporated into the predicted age-earnings profile by assuming a rate of unemployment of 7.5 per cent.

[In another section of the sensitivity analysis predicted age-weekly earnings profiles for high school and university graduates that fix weekly hours of work at 40 hours for both groups are used. This is done by using the same methods as described above but estimating regression equations for log hourly earnings instead of log weekly earnings. The predicted age-weekly earnings profile for an education group is generated by taking the predicted hourly wage for each age from the regression models and multiplying by 40.]