Why Study at a Mature Age? An Analysis of the Private Returns to University Education in Australia

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Abstract

Using data from the 2001 Australian Census of Population and Housing, this article estimates private rates of return to university education at the bachelor degree level for males and females, and determines the age threshold when studying for university qualifications becomes no longer worthwhile.

Employing a methodology analogous to Borland (2002), the results indicate that the rates of return for individuals undertaking three year university degrees at the median commencement age of 19 years are 24.8 per cent for males and 20.6 per cent for females; and that returns continue to outperform share market investments right up until males begin their studies in their late thirties and females, much later, in their mid fifties. This article has important policy implications for the problems associated with skilled-labour shortages and the ageing population. Greater subsidizing of tuition fees and extension of the retirement age are suggested to make the education investment of mature age individuals even more profitable.

1. Introduction

Why study? What benefits can be gained from university study? What are the costs? These are some of the questions considered by most individuals, whether in the final years of school, or well after finishing compulsory schooling and contemplating a return to study as a 'mature age' student.

The existing literature on private rates of return is based on the human capital model (Mincer 1958; Schultz 1961; Becker 1964), which suggests increases in education provide individuals with enhanced skills, knowledge and ability, resulting in higher lifetime earnings. The profitability of investment in education has generally been assessed using internal rates of return.

The first Australian study to calculate private rates of return was Blandy and Goldsworthy (1975), using South Australian data for males only for 1968/69. Their estimated return to an average 3-4 year bachelor degree inclusive of $400 tuition fees was 13.9 per cent (or 15.2 per cent with no fees). Subsequent studies by Chapman (1977), Miller (1982; 1984), Chia (1991) and Maglen (1994) estimated comparable private rates of return for males ranging from 11.3 per cent (Chapman 1977) to 24.0 per cent (Miller 1984). Only two of these earlier studies also calculated returns for females, with estimates ranging from 13.2 per cent (Maglen 1994) to 21.2 per cent (Miller 1982). The large variation across returns for both males and females can be attributed to differences in the assumptions made or data used.

Overall, these early studies showed that rates of return were in decline over the period from the 1970s to the mid 1980s.

A number of changes to the financing arrangements for higher education in

Australia took place during the late 1980s, the most significant being the introduction of tuition fees via the Higher Education Contribution Scheme (HECS) in 1989 (see Chapman and Ryan 2003 for more detail on the initial and revised versions of HECS).

Studies of private rates of return to an average bachelor degree using data from the post HECS period, include Chapman & Chia (1989)[1], Maglen (1994), Daly and Jin (1995), Chapman & Salvage (1997), Borland *et al.* (2001), Borland (2002) and Lewis *et al.* (2004). Rates of return for males from these studies ranged from 4.0 per cent for an average 3 year university degree using regression adjusted hourly earnings (Borland 2002) to 33.1 per cent for an average 3 year university degree adjusted for the probability of unemployment and earnings whilst studying (Lewis *et al.* 2004).

Four of these studies also provided rates of returns for females (Chapman and Chia 1989; Maglen 1994; Daly and Jin 1995; Chapman and Salvage 1997). Estimated returns ranged from 5.8 per cent for an average 4 year bachelor degree (Chapman and Salvage 1997) to 22.7 per cent for indigenous Australians with an average 3 year bachelor degree adjusted for ABSTUDY payments (Daly and Jin 1995).

Overall, these studies did not reveal any consistent direction in rates of return over the period from the late 1980s to the most recent estimates in 2001.

What the literature fails to deliver is the age threshold when comparison between the private rate of return and the return on alternative investments suggests it is no longer worthwhile pursuing further education. Australian studies estimating 'mature age' private rates of return could not be found. However, a review of the international literature revealed only two studies which focus their attention on such estimates.

The first, Egerton and Parry (2001), using the General Household Surveys for the

10 years 1983 to 1992 converted to 1987 prices, estimated private rates of return in Great Britain to an average 3 year full-time university degree for males and females commencing study at the modal mature ages of 26 and 29 years, respectively[2]. The OLS regression technique is used to estimate earnings profiles for combined full-time employees and self employed individuals, using the coefficients of the variable time since qualification[3].

Estimated rates of return, adjusted for the probability of unemployment and no allowance for tuition fees (applying at the time), were 1.5 per cent for males at age 26 years and 5.6 per cent for females at age 29 years. Comparative returns for young graduates were 9.6 per cent and 27.0 per cent, respectively. Egerton and Parry (2001) conclude that the returns for mature age graduates are inequitable given that many mature graduates have already made tax contributions to the costs of higher education. Therefore, they suggest there is a case to be made 'for a reform of student funding: one which takes into account increased diversity in graduate pay, decreased job security in some professions, and decreased lifetime earnings in respect of maturity' (p. 23).

The second study by Blondal *et al.* (2002), using OECD data from eight countries in 1999-2000, estimated private rates of return to an average university degree for males commencing study at age 40 , 45 and 50 years[4]. All the calculations assume that the wage premia or earnings benefits received on completion of an average length degree are identical to those received by a young male graduate finishing his degree, and that they evolve over time in line with those for a young graduate. Further assumptions were an allowance for unemployment risk and applicable tuition fees in each country.

The United Kingdom had the highest estimated returns at 11.1 per cent, 8.8 per

cent and 5.5 per cent, at age 40, 45 and 50 years, respectively. Germany had the lowest rates of return (mainly due to the longer average length of a degree) at -1.5 per cent, -9.7 per cent and -23.0 per cent, respectively. Comparable rates at young graduate ages were 18.5 per cent and 9.1 per cent for the United Kingdom and Germany, respectively. Blondal *et al.* (2002) recognise that the higher foregone earnings whilst studying at mature ages are one reason why estimated returns offer 'scant, if any, financial incentives for adults to pursue long-lasting studies' (p. 32). They suggest education programmes should be designed to reduce these opportunity costs, such as greater use of intensive or modular courses, or delaying retirement.

The current study employs a methodology to estimate private rates of return closely following Borland (2002). Estimation of the mature age study threshold expands the methodology frontier in this area by using a more comprehensive sensitivity analysis of higher education commencement ages.

The remainder of this paper is organized as follows. Section 2 outlines the data and methodology used. Section 3 provides empirical results for private rates of return and the age threshold when studying is no longer worthwhile in terms of private rates of return. Finally, a summary of the main findings, policy implications and recommendations for future research are presented in Section 4.

2. Data and Methodology

Two datasets are used in this paper – the 2001 Census of Population and Housing Household Sample File (Australian Bureau of Statistics (ABS) 2003) and the 2001 Survey of Education, Training and Information Technology (SETIT), (ABS 2002). The Census Household Sample contains 188,013 observations with each observation

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containing information on a variety of individual characteristics such as weekly income, labour force status and level of non-school qualification. Census data is used for assumptions underlying the private rate of return estimations. The SETIT dataset contains 24,377 observations on persons aged 15-64 years and is used for evidence regarding the median study commencement age.

Before summarizing the methodology, it is worth mentioning the distinction between income and earnings. The Census data relates to income received not just from earnings but also from other sources, such as unemployment benefits, student allowances, dividends, family payments and child support. Therefore, the ratio of female to male income from all sources could be larger or smaller than the corresponding ratio for earnings only. However, Jones (1983) suggests the inclusion of unearned income is not likely to affect general conclusions based on census data. He refers to the 1978-79 ABS survey of incomes, which finds the ratio of female to male incomes for all workers is little affected by the inclusion of unearned income. Therefore, income is used interchangeably with earnings in this study.

In this section the two discrete steps in the methodology are summarized. First, following Borland (2002), the methodology for estimating private rates of return at the bachelor degree level is discussed. Second, the methodology for estimating the age threshold when it is not worthwhile in terms of private returns to university study is determined.

2.1 Rates of Return

Making an informed investment decision in human capital or education requires evaluation of both the costs and benefits. The measure most commonly used in the

literature to evaluate such an investment is the internal rate of return or 'private rate of return to education' (Norris *et al.* 2005: 76), which equates the present value of the benefits and costs streams as follows:

$$\sum_{i=1}^{n+k} \frac{C_i}{(1+r)^i} = \sum_{i=n+1}^{m} \frac{B_i}{(1+r)^i} \tag{1}$$

where C_i represent the costs (opportunity cost of foregone income, direct costs of books and travel, and tuition fees) at age i, where $i = 1$ at the study commencement age; n is the length to completion of university qualifications; k is the number of years to pay off the deferred HECS debt after completion of the university qualification (if HECS is paid up-front k is 0); B_i represents the stream of benefits (including the difference in after-tax earnings for a university qualified individual over a secondary school qualified individual) to this investment decision at age i; m is the retirement age and so $m - n$ is the number of years spent in the workforce until retirement after completion of the university qualification; and r is the internal rate of return to the investment in education.

In order to calculate the private rate of return to an investment in university education, this study adopts a similar procedure to that of Borland (2002). It assumes that a hypothetical individual, who has at least completed year 12 secondary schooling, has to make an informed investment decision at the end of 2000 about whether to go to university or join the workforce in 2001. The estimations are initially based on some 'base case' assumptions, as follows:

First, following Miller (1982), lifetime earnings profiles (LEPs) representing average annual full-time earnings for an individual completing year 12 or equivalent and an individual completing a bachelor degree are estimated from the 2001 Census.

A sample of 12,306 observations on individuals aged 15-64 years is used. This

sample comprises individuals who have worked more than 34 hours a week and therefore categorized as full-time employees, who have earned a positive income in the week prior to the Census, who have completed a bachelor degree qualification or at least completed year 12 or equivalent secondary schooling, who have not been studying at the time of the Census and who have not been visiting from overseas.

Working age is classified in the Census dataset in single years from 15-24 years and then in 5 yearly age groups, ranging from 25-29 years to 60-64 years. Individual weekly income earned in the week prior to the Census is provided in a number of ranges. The midpoints of these income ranges are used to create the profiles. The highest income range, at $1,500 or more, is multiplied by 1.33, a method also used by Borland *et al.* (2001) and Borland (2002), to create the equivalent midpoint.

To create the average annual LEPs separately for males and females, the following approach is used. For each age or age group, weighted average weekly earnings are multiplied by 52 to obtain (gross) average annual income. The profiles are then estimated using the average annual income at the individual ages and the midpoints of the 5 year age ranges. It is assumed that a linear relationship exists between each of the midpoints of the 5 yearly age ranges. For individuals aged 63 and 64 years, average annual earnings are the same as those for age 62 years (midpoint of 60 to 64 year age group). Hence, retirement age in the 'base case', is assumed to be at the end of the 64th year for both males and females (also assumed by Borland 2002).

A second assumption is that the real income growth is 1.75 per cent (equal to the Productivity Commission's (2005: 102) estimate for the period 1966-67 to 2003-04). This is slightly lower than Borland (2002) and Miller (1982), who both used 2 per cent.

Third, expected average annual earnings at each age are the sum of average annual earnings and unemployment benefits weighted by the probabilities of employment and unemployment, respectively. Average unemployment benefits received for unemployed individuals looking for full-time work are estimated using rates applicable as at 20th September, 2001 (Department of Family and Community Services 2001). An estimate of $12,132 per annum is used here. This represents average weekly unemployment and sickness benefits for single and married individuals, plus additional weekly benefits for rent assistance and having one or two children, multiplied by 52. Borland (2002) also adjusts for the probability of employment and unemployment.

Fourth, marginal tax rates (MTR) and thresholds applicable to the financial year 2000/01 are applied to annual earnings over the period 2001 to 2004. However, adjustments to these MTR and thresholds reflecting policy changes by government and partial inflation indexation were made in 2003/04, 2004/05 and 2005/06. To account for some of the impacts of these changes, the 2005/06 MTR with discounted thresholds to represent equivalent 2000/01 thresholds are used to calculate post tax annual income received from 2005 onwards (see Appendix 1 for details). It is hoped this adjustment for the most recent changes in the MTR and thresholds will alleviate some of the bracket creep resulting from real income growth referred to by Borland (2002). Borland adjusts for MTR applicable in 2000/01 for all his estimates of post-tax earnings.

Fifth, commencement ages in 2001 for full-time only male and female bachelor degree students are estimated using the median student age from the SETIT data (ABS 2002). The 15-64 year age range is used and only those individuals with the intention to complete this degree are considered. Overseas students are excluded. Using this method

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the median commencement age for both males and females falls in the age range 15-19 years. Further assumptions about individual ages in 2001 are made using the cross-classification age left school by year left school. The resulting median commencement ages, incorporating an additional assumption for fractional years, are estimated at 18 years and 11 months for males and 19 years and 4 months for females[5].

However, due to the difficulty of estimating rates of return for fractional years, 19 years is used as the 'base case' commencement age for both full-time males and full-time females. Borland (2002) uses a commencement age of 18 years based on the school leaver age. This study follows Borland in assuming that it takes 3 years for full-time students to complete an average 3 year degree or 4 years for full-time students to complete an average 4 year degree. Thus, new graduates enter the job market at age 22 years (or age 23 years for those who completed a 4 year degree).

Next, annual student earnings are estimated from the Census data for full-time students aged 19 to 22 years who are attending university or another tertiary institution. Since the Census was conducted on the 7th August, these weekly earnings may not represent earnings over a full year. Therefore, annual student earnings are estimated in two parts. First, weekly earnings for study weeks are multiplied by 36 (University of Western Australia (UWA) 2005a) and indexed for real income growth. No adjustment for Government benefits, such as Youth Allowance, is needed here because the Census includes these in its classification for individual gross weekly income (ABS 2001). Second, vacation earnings (16 non-study weeks) are estimated using the weighted average earnings of all full-time and part-time employees having completed year 12 or equivalent but not currently studying or having a non-school qualification. Adjustments

are made for the real growth in income and unemployment[6].

Estimates of pre-tax annual student earnings adjusted for real growth and the probability of employment are $10,285 in 2001, $12,958 in 2002, $15,203 in 2003 and $16,049 in 2004 for males aged 19, 20, 21 and 22 years, respectively, and $10,875, $12,483, $14,974 and $15,762 for females. These results are similar to those obtained by McInnis and Hartley (2002), who conducted a survey in September 2001 on 1,563 students across nine Australian universities. They found that male and female students work an average of 14.7 hours per week, with males earning an average hourly rate of $16.22 and females $14.59. Furthermore, they found that 92% of the students work both during the semester and in university breaks and holidays. These rates yield annual student earnings of $12,399 and $11,152 for males and females respectively, but are not age specific.

Another 'base case' assumption is that the alpha coefficient, which measures the proportion of the earnings differential dependent on the level of education, is equal to 1.0. This suggests that the entire earnings differential between an average year 12 high school graduate and an average bachelor degree graduate is attributed to education. Borland's (2002) study also implies an alpha coefficient of 1.0. Other Australian studies have assumed an alpha coefficient of 0.8 (see, Miller 1982; Miller 1984; Maglen 1994). For these studies, the remaining proportion of 0.2 is assumed to be attributed to factors like ability, social class, motivation and origin among others.

It is assumed that HECS is charged at the Band 2 rate (the average annual student fee) of $5,015 (University of Southern Queensland (USQ) 2001) and is paid via the deferred payment option. The most recent changes to the HECS repayment rates and

income ranges in 2004/05 are applied by converting them to 2000/01 dollars using the same methodology to discount MTR. In this study, these repayments are first applied in 2004, when the average 3 year full-time bachelor graduate commences their first year of full-time work (see Appendix 1). This adjustment is assumed to be made at the end of each year when annual income is determined. Borland's (2002) 'base case' also uses the Band 2 rate but with the HECS payment up-front option.

Annual direct costs of study are assumed to be $1,560 per annum. These include ancillary fees, books and parking costs of $591 (based on the estimate of $15 a week for 36 weeks from the National Union of Students in 1998 (see, Jansen and Tapinos 2004: 34)), $880 (based on the estimate of $800 in Borland *et al.* (2001)) and $89 (based on the student annual fee of $99 from UWA (2005b), respectively[7]. Borland (2002) uses an assumption of $2,000 per annum.

Finally, consumption benefits, following the methodology of previous studies, are assumed to be zero[8] (Miller 1982; Productivity Commission 1997).

2.2 Mature Age Study Threshold

The rates of return used are for study commencement in 2001 at each age from 19 years to 64 years for an average 3 year full-time bachelor degree. The twenty-year (1 Jan 1985 to 31 Dec 2004) per annum compound after tax *real* return[9] on Australian shares, based on listed shares with price movements and dividend reinvestment consistent with the S&P/ASX All Ordinaries Accumulation Index (Russell Investment Group 2004) is used for comparison with the rate of return to education.

Estimated LEPs from the 'base case' suggest that annual earnings at each age represent all individuals who graduated at younger ages. Therefore, using these profiles

to generate earnings until retirement for mature age graduates is likely to produce an upward bias. Hence a different approach is needed. This involves three steps. In step one, earnings at the graduate starting age, E_0, are estimated from the Census data for 2000/2001 graduates (see Appendix 2). In step two, from the second year of work, the estimated earnings, E_i (where $i = 1$ at the age in the second year of work), are the weighted average of the LEP for that age, Y_i, and the previous year earnings estimate, E_{i-1}. That is,

$$E_i = W\,Y_i + (1-W\,)E_{i-1} \tag{2}$$

The weight, W, is calculated using the formula: $W = 2/(L+2)$; $0 < W \le 1$, where L is the difference between the age at work commencement and the base case work commencement age of 22 years (derived from Berenson and Levine 1999: 923-927)[10]. The weighting applies until the age at which the earnings estimate coincides with the LEP earnings. At that age and beyond (step three), the LEP is the earnings estimate, so $E_i = Y_i$.

These steps are repeated for each commencement age between 23 and 60 years. For new graduates starting work at age 22 years, the LEP is used for the estimated earnings at all ages (see Appendix 2 for examples of adjusted profiles). Thus, a new female graduate starting work at age 37 in 2004 is assumed to have earnings of \$43,871 (step one). In the second year of work, earnings are estimated using the following calculation (step two); $E_{38} = (W)Y_{38} + (W-1)E_{37}$; where $W = 2/(15+2) = 0.1176$. This approach is used until age 59 years at the 23rd year of work. Then, in the 24th year of work at age 60, the smoothed earnings, E_{60}, coincides with the estimated earnings, Y_{60}, so for ages 60 to 64 years (step three), LEP estimates, Y_i, are used.

This adjustment provides exponential smoothing of the earnings profiles in the early years for mature age individuals to better represent the earnings in the early part of their graduate working life. Compared to the international studies by Egerton and Parry (2001) and Blondal *et al.* (2002), this method allows for rates of return to be estimated for mature graduates at every age until retirement. Furthermore, whilst not a perfect adjustment, it is hoped to account for a smoother transition to the average bachelor profile to better represent the earnings stream for mature age graduates.

Estimates of annual student earnings by age and age range for each three year full-time commencement age in 2001 utilise the same methodology as the base case. However, the value estimated for each five yearly age range in the 16 non-study weeks is assumed to apply equally to all ages in that corresponding age range. For the 36 study weeks, the same approach is used for the five yearly age range 25-29 years, but due to small sample sizes in the remaining five yearly age ranges from 30-64 years, the value estimated combining these age ranges is assumed to apply equally across that corresponding age range. Furthermore, as in the base case, yearly values are adjusted for real growth and the probability of unemployment.

3. Results

This section provides a comprehensive review of the main findings of this study. Section 3.1 gives the estimated private rates of return including the impacts of adjustments to base case assumptions. Section 3.2 shows the age threshold when investing in education might not be considered the best investment choice for a 'mature age' individual.

3.1 Private Rates of Return to Education in Australia, 2001

Row 1 of Table 3.1 shows the 'base case' estimations of the private rates of return for an individual studying full-time for either 3 or 4 years.

Table 3.1: Private Rates of Return to University Education, 2001

	Average 3 Year Bachelor Degree		Average 4 Year bachelor Degree	
	Male (%)	*Female (%)*	*Male (%)*	*Female (%)*
Base Case	24.8	20.6	19.6	16.6
Sensitivity Analysis				
HECS Up-Front	22.4	18.6	17.8	15.2
HECS Deferred Rates[a]				
Band 1 ($3,521)	25.4	21.1	20.1	17.1
Band 3 ($5,870)	-	-	19.3	16.4
Real Income Growth				
1.45	24.5	20.3	19.3	16.4
2.05	25.1	20.8	19.9	16.9
Retirement				
60 (end of 59th year)	24.8	20.5	19.6	16.6
55 (end of 54th year)	24.8	20.5	19.5	16.4
Alpha Coefficient				
0.8	21.0	17.4	16.6	14.0

Notes: (a) Rates available from USQ (2001).

At the 3 year bachelor degree level, using the base case assumptions, the private rates of return for males and females are 24.8 per cent and 20.6 per cent, respectively. The best comparative estimates for males in 2001 from Lewis, Daly and Fleming (2004) and Borland (2002) are 32.1 per cent and 17.0 per cent, respectively. However, these are not their base case returns. The Lewis, Daly and Fleming base case return is 15.9 per cent. They assume no earnings for students whilst studying and make no adjustment for the probability of employment. Borland's (2002) base case estimate of 14.5 per cent is based on the assumption that HECS is paid up-front, whereas this study assumes HECS is deferred[11]. There are other differences in the assumptions between this study and these two earlier studies related to unemployment benefits received, HECS and MTR

adjustments and student earnings. It is the intention of this study to provide greater realism in these assumptions and, as a result, the estimated returns.

The estimated rate of return for females, at 20.6 per cent, is around 4 percentage points lower than for their male counterparts. One explanation for this result, revealed by the LEPs (Appendix 2 includes these base case profiles) over the ages between 24-49 years, is the higher earnings benefits between bachelor graduate males and year 12 qualified males than for the corresponding difference for females. This is a cause for concern, particularly as the undergraduate enrolments of females exceed that of males in recent years (Austen and Giles 2003).

Sensitivity analysis using the HECS upfront payment option, inclusive of a 25 per cent discount, produces rates of return estimates of 22.4 per cent and 18.6 per cent for males and females, respectively. As these are lower than the deferred payment option by over 2 percentage points, it suggests paying up-front, at the current discount, does not provide the best rewards. Chapman and Chia (1989) refer to the need for a 40 per cent discount to make paying up-front worthwhile, which is something policy makers might need to consider. Interestingly the up-front discount has been reduced to 20 per cent as of January 1, 2005 (Department of Education, Science and Training 2005). If HECS deferred is charged at the Band 1 rate, returns increase by less than 1.0 percentage point. Increasing (decreasing) the assumed real income growth rate increases (decreases) rates of return slightly. Early retirement has a minimal impact on returns as IRR methodology places much more emphasis on costs and benefits in the early years. Finally, accounting for ability using an alpha coefficient of 0.8 reduces the returns to males and females by 3.8 and 3.2 percentage points, respectively. These are in-line with Miller (1982) who

recognises that the alpha adjustment will have a larger impact in percentage points, the higher the initial rate of return.

Returns estimated for an average 4 year bachelor degree at 19.6 per cent and 16.6 per cent for males and females, respectively, are predictably lower than the 3 year returns due to the additional year of both up-front costs and foregone earnings. Using the sensitivity analysis these returns are consistently around 5 percentage points lower for males and 4 percentage points lower for females compared with three year bachelor degree returns. However, these are still reasonable returns to university education.

3.2 Mature Age Study Threshold

The results from the estimation of the rates of return for full-time students commencing an average 3 year bachelor degree in 2001 at age 19 years and for commencement in 2001 at age 20 years right through to commencement at an age of 57 years for males and females, respectively, are provided in Figure 1[12].

Figure 1: Rates of Return by Commencement Age, 2001
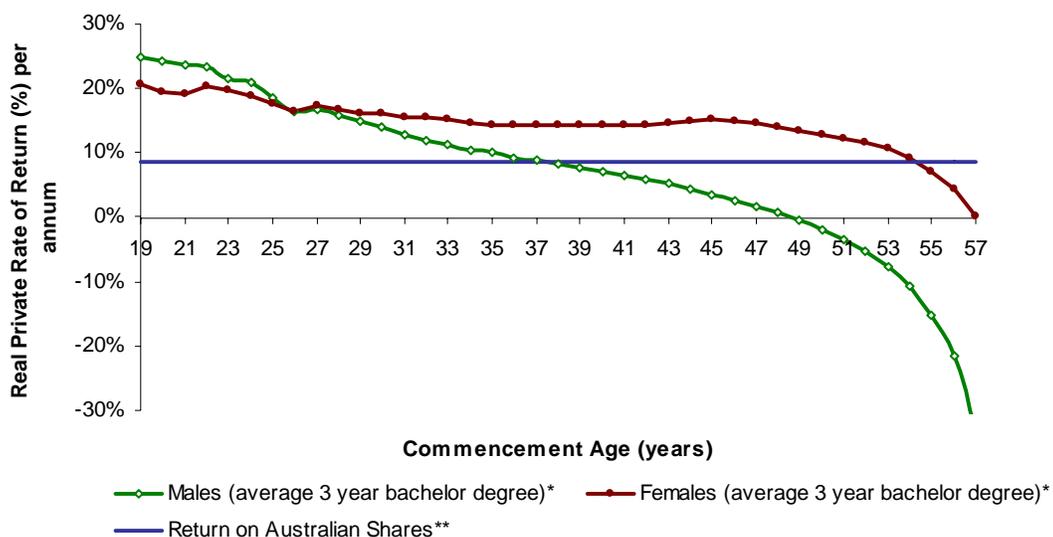
Notes: (*) Linear interpolation is made between each age as a reasonable approximation.

In comparison to an investment in the Australian share market, education is a more profitable investment choice for both males and females commencing tertiary study right up until an age of 37 years for males and 54 years for females. That is, the age threshold at which an individual should question whether an investment in education is financially worthwhile is 38 years of age for males and 55 years of age for females. From these ages, Figure 1 shows that rates of return remain below the share market average, becoming highly negative and declining much earlier and more sharply for males than returns for females. For males, this can mainly be attributed to a declining difference in bachelor earnings over year 12 or equivalent foregone earnings, whereas the same difference for females remains quite wide, particularly over the range 50-59 years (see Appendix 2 for profile examples at these ages). Additionally, the shorter the time period until retirement to receive higher earnings, the greater is the negative impact on returns, particularly for males.

Further analysis of Figure 1 shows that males commencing study from ages 19 through to 25 years are estimated to receive higher returns than females at the same commencement ages. From a commencement age of 26 years onwards, females are estimated to earn a higher rate of return than males. Furthermore, the return to female graduates remains quite flat over the age range 34-43 years, before reaching a small peak at around 45 years. This is mainly due to the foregone earnings whilst studying being quite low in the later years of the female profiles, so the benefits to obtaining a bachelor degree continue to be profitable. For males the opportunity cost increases with age to a peak at 52 years, so the benefits are reduced, causing a sharp decline in the estimated

returns. Clearly, the estimates are quite sensitive to the assumption regarding foregone earnings.

4. Summary and Conclusions

This study is an attempt to estimate the private rates of return to university education and to determine the age threshold at which it is no longer worthwhile, in terms of private returns, to study for university qualifications.

Results from the estimation of rates of return for the base case average 3 year full-time bachelor degree graduate in 2001 were 24.8 per cent for males and 20.6 per cent for females. Comparative study estimates in 2001 from Borland (2002) at 17.0 per cent and Lewis, Daly and Fleming (2004) at 32.1 per cent suggest the assumptions used in this paper are based on good foundations.

If a sensitivity analysis is applied to the base case, combining the following changes of HECS paid up-front (versus HECS deferred in the base case), productivity growth of 2.05 per cent (versus 1.75 per cent), retirement at 55 years (versus 65 years) and an alpha coefficient at 0.8 (verses 1.0), then rates of return are reduced to 19.4 per cent for males and 16.1 per cent for females. The return for males is slightly lower than the closest comparative estimate of 22.0 per cent in 1997 from Borland *et al.* (2001).

An innovation in this study concerns the search for the mature age study threshold. Compared to an investment in the Australian share market at 8.6 per cent, tertiary level education is a more profitable investment choice for males and females commencing study right up until an age of 37 years for males and 54 years of age for females. That is, the age threshold when studying, from a pecuniary point of view, will be questioned is at 38 years of age and 55 years of age for males and females, respectively.

Beyond these ages, rates of return remain below the share market average and for males decline much more quickly than for females. This is attributed to the high foregone earnings whilst studying and subsequent smaller difference in earnings benefits for male bachelor degree holders and those with year 12 qualifications at these ages. For females foregone earnings remain quite low and subsequent earnings benefits quite large, thus providing greater rate of return rewards at maturing ages. Additionally, the shorter time until retirement to receive higher earnings in these years has an impact on returns for both males and females. These findings are not inconsistent with the findings of international studies by Egerton and Parry (2001) and Blondal *et al.* (2002). However, unlike these studies, this paper provides rates of return for each mature graduate starting age until retirement and furthermore accounts for a smoother transition to the average bachelor profile to better represent mature age graduates.

The implications of these results suggest that education is a profitable investment for many mature age individuals. This has important policy implications for the problems centering around the shortages of skilled labour, ageing population and long term structurally unemployed older workers. This could be facilitated through university child care for woman, balanced portfolio of campus activities and extensions of the statutory retirement age to make the education investment of mature age individuals even more profitable. Even partial subsidizing of employers to provide graduate opportunities for mature age individuals could be provided, particularly for those males considering study in their late thirties. Furthermore, this paper lends support to Chapman and Chia's (1989) suggestion for a 40 per cent discount to make the HECS up-front option worthwhile. Considering the discount rate for upfront payment has been reduced in 2005

to 20 per cent, policy makers should reconsider the size of this discount.

In all of these ways government can begin to encourage and promote a *kaizen*[13] mindset. As a result, we may even see an increase in the mature age study threshold for males and females over the next few decades.

The differences in results shown in this paper and from earlier studies clearly demonstrate that estimates of rates of return are sensitive to both data and assumptions. Further research should also focus on the mature age study threshold by looking at a greater disaggregation by field of study and using the regression technique to estimate earnings. Also, a more specific estimation of earnings for students commencing degrees at a mature age could extend this study's use of the Census classification for year completed non-school qualification to incorporate earlier years of completion. Further disaggregation of rates of return by occupation, indigeneity, region and other levels of qualification could also be estimated.

Appendices

Appendix 1: MTR and Thresholds and HECS Rates and Thresholds

Table A1: Actual MTR and Thresholds for 2000/01[a]

Taxable income	Tax on this income
$0 – $6,000	Nil
$6,001 – $20,000	17c for each $1 over $6,000
$20,001 – $50,000	$2,380 plus 30c for each $1 over $20,000
$50,001 – $60,000	$11,380 plus 42c for each $1 over $50,000
Over $60,000	$15,580 plus 47c for each $1 over $60,000

Notes: (a) These are applied to calculations from the year ending 2001 to the year ending 2004.

Source: Australian Taxation Office (2005c)

Table A2: Estimated MTR from 2005/06 with Thresholds Discounted to 2000/01[a,b]

Taxable income	Tax on this income
$0 – $6,000	Nil
$6,001 – $20,000	15c for each $1 over $6,000
$20,001 – $55,300	$2,100 plus 30c for each $1 over $20,000
$55,301 – $83,400	$12,690 plus 42c for each $1 over $55,300
Over $83,400	$24,492 plus 47c for each $1 over $83,400

Notes: (a) These are applied to calculations from the year ending 2005 to year ending 2046 (at retirement).
b) Discounting uses the CPI Index value for the financial year ending 2000/01 at 133.8 as the base (ABS, 2005). The CPI index value used for 2005-06 at 152.5 is estimated by increasing the ABS 2004/05 index value of 148.4 with the median expectation for inflation by market economists and union officials of 2.75% (RBA 2005: 62-3). Thresholds are then divided by 1.1398 (152.5/133.8) and rounded to the nearest hundred to adjust them to 2000/01 thresholds. However, if a discounted threshold is lower than the actual threshold applicable in 2000/01 (see, Table A1) then the actual 2000/01 threshold is used instead.

Source: Australian Taxation Office (2005b)

Table A3: HECS Rates for 2004/05 with Thresholds Discounted to 2000/01[a,b]

Year	HECS Repayment Income (HRI)	Repayment Rate
2004–05	Below $31,601	Nil
	$31,601–$35,200	4% of HRI
	$35,201–$38,700	4.5% of HRI
	$38,701–$40,800	5% of HRI
	$40,801–$43,800	5.5% of HRI
	$43,801–$47,500	6% of HRI
	$47,501–$50,000	6.5% of HRI
	$50,001–$55,000	7% of HRI
	$55,001–$58,600	7.5% of HRI
	$58,601 and above	8%

Notes: (a) These are applied to gross earnings (adjusted for growth and unemployment), with the HECS fee then deducted from post-tax earnings. The deferred payment option is first applied in the year ending 2004 for 3 year graduates and the year ending 2005 for 4 year graduates.
b) Discounting uses the CPI Index value for the financial year ending 2000/01 at 133.8 as the base and 148.4 for the financial year ending 2004/05 (ABS, 2005).Thresholds are then divided by 1.1091 (148.4/133.8) and rounded to the nearest hundred to adjust them to 2000/01 thresholds.

Source: Australian Taxation Office (2005a)

Appendix 2: Exponential Smoothing Adjustment: Profile Examples

**Table A4: Estimated New Work Commencement Age Income Values for Exponentially Smoothed Profiles, 2001[a,b]**

	Age or Age Range (years)			
	23	24	25-29	30-64
Gender	Weighted Average Annual Income ($)			
Male	41,203 (35)	41,381 (27)	44,541 (47)	49,615 (65)
Female	33,833 (44)	35,298 (29)	40,058 (48)	43,871 (60)

Notes: (a) Values in brackets represent the sample size used.

(b) Values are estimated using the base case LEPs cross-tabulated by age, income and non-school qualification year completed 2000/01. Estimates for new graduates commencing work at age 23 years and 24 years use the weighted average income from the corresponding sample created at these ages. Estimates for new graduates commencing work at each age in the range 25-29 years also use the corresponding sample created from this age range. The remaining five yearly age ranges are combined due to small sample sizes, to estimate weighted average income values for new graduates commencing work at each age in the range 30-64 years.

Source: Estimated from the 2001 Census

Figure A1: Base case LEPs and Exponentially Smoothed Profiles for Bachelor Degree Males by Selected Work Commencement Ages, 2001
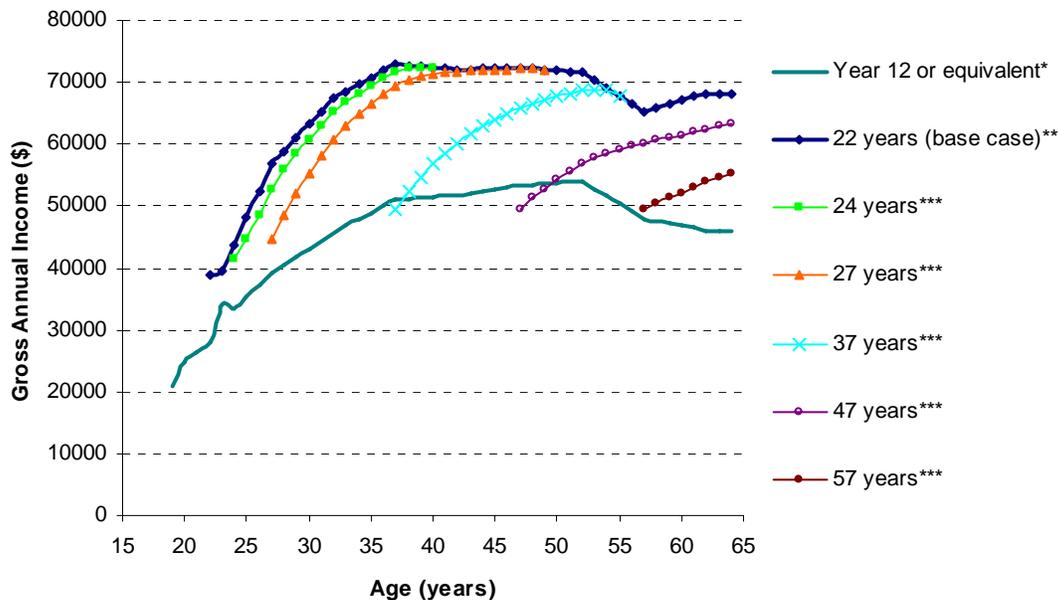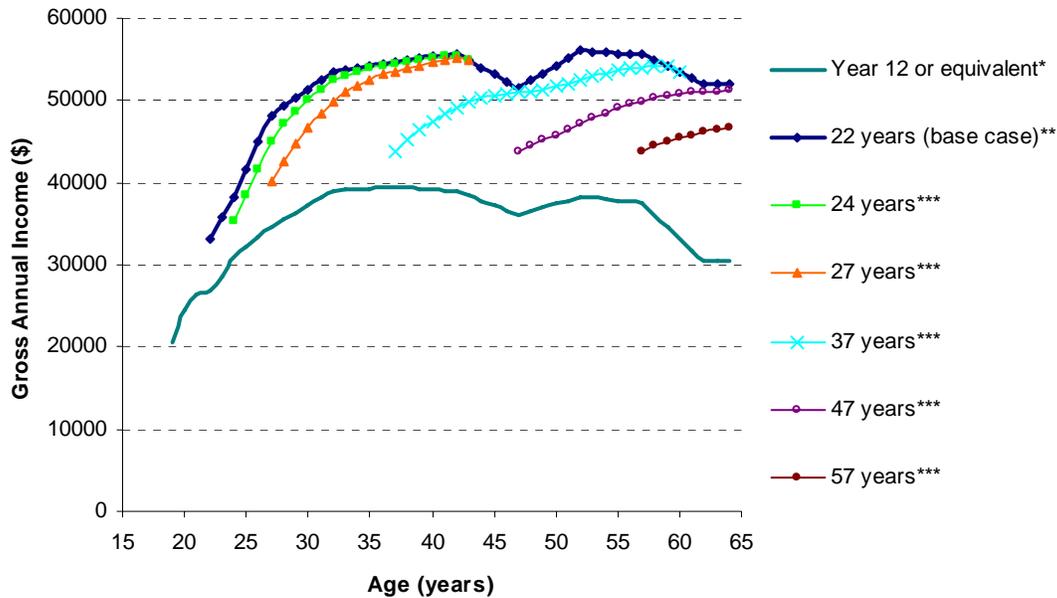

Notes: (*) Estimated year 12 or equivalent LEP from the base case (refer to assumption 1). This profile also represents foregone earnings from each study commencement age until retirement.

(**) Estimated bachelor degree LEP from the base case (refer to assumption one).

(***) Work commencement age in 2004 after 3 years study. This profile starts with the estimated income value from Table A4 and subsequent partial (exponentially smoothed) earnings profile up until (if applicable) reaching the 'base case' profile. At this point the profile is same as the 'base case'.

Source: Estimated from the 2001 Census

Figure A2: Base case LEPs and Exponentially Smoothed Profiles for Bachelor Degree Females by Selected Work Commencement Ages, 2001

Notes: (*) Estimated year 12 or equivalent LEP from the base case (refer to assumption 1). This profile also represents foregone earnings from each study commencement age until retirement.

(**) Estimated bachelor degree LEP from the base case (refer to assumption one).

(***) Work commencement age in 2004 after 3 years study. This profile starts with the estimated income value from Table A4 and subsequent partial (exponentially smoothed) earnings profile up until (if applicable) reaching the 'base case' profile. At this point the profile is same as the 'base case'.

Source: Estimated from the 2001 Census

Endnotes

[1]   Chapman and Chia (1989) index earnings data from the ABS Income and Housing Survey of 1985/86 to 1988 dollars in order to gauge the effects of HECS. Their results are therefore included with studies for the post HECS period.

[2]   Egerton and Parry (2001) also estimate returns for young graduates from working class origins and young graduates from middle class origins with a commencement age of 18 years.

[3]   This variable is fitted as dummy variables coded in three-year segments, ranging from 4 years since qualification to 34 years for males (31 years for females). As such, the estimated earnings at each 3 yearly age segment represent the average from all mature graduates with the same time since qualification.

[4] Blondal *et al.* (2002) also estimate returns for young graduates with commencement ages comparable to the Australian studies.

[5] For example, for full-time males there are 9 students assumed at age 17 years or below and a further 35 students required to reach the median of the age range 15-64 years at the 44th student. Therefore, with a total of 37 students assumed at age 18 years; 35/37 = 0.95 or 0.95*12 = 11.35 months; so the median commencement age is estimated to be 18 years 11 months (rounded down). Further details of these and other estimations for females are available from the author upon request.

[6] Borland (2002) includes student earnings for 40 weeks in the year and assumes students do not receive any benefit payments such as the Youth Allowance.

[7] All costs are converted to 2001dollars (as at 1st January) using the CPI (ABS, 2005).

[8] For most students the consumption benefits of education go beyond an enhanced capacity for earning income. The additional benefits of class discussions and social life combine to provide personal satisfaction (Sharp *et al.* 1992: 79). Unfortunately, measuring such consumption benefits is beyond the scope of this study.

[9] Calculated using the average of the lowest and highest MTR adjusted nominal returns less average inflation over the period of 4.0%.

[10] The formula for the weight cited in Berenson and Levine is $W = 2/(L+1)$. Given the definition used in this study for *L,* the denominator of this formula was changed to L+2 to allow for a weighting of less than 1 in the early working years at the graduate starting age of 23 years. In any case Berenson and Levine recognise the choice of weight is somewhat subjective.

[11] Delayed payment is preferred by 75 per cent of students (Productivity Commission 1997: 1).

[12] Fifty-seven years is chosen for females and males, respectively, as the age where the HECS deferred tuition fees are able to be fully re-paid. Beyond these years HECS would have to be paid back with income earned beyond the retirement age at 65 years.

[13] This is Japanese for continuous learning.

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