

The Rate of Return to Higher Education Over the Business Cycle

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Abstract

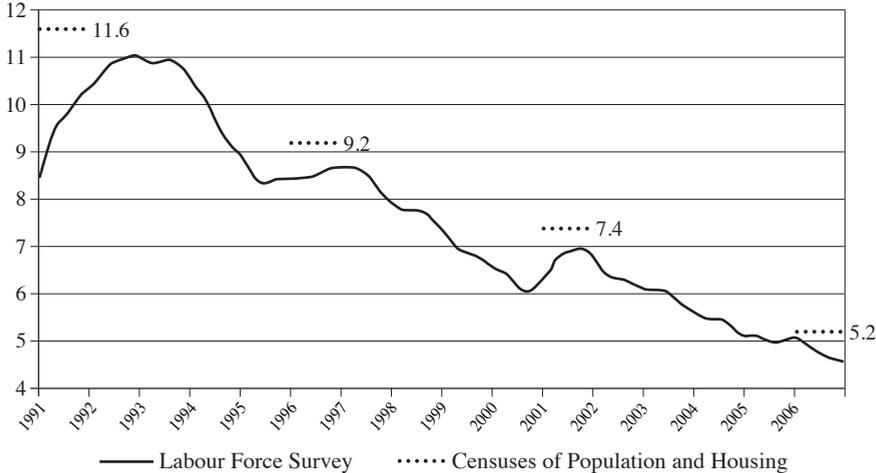
Currently there is only a scant literature available on the business cycle effect upon the private rate of return to higher education in Australia. This is despite the expectation that the business cycle would be of a significant consequence to the relative income of degree holders. This paper presents estimates of the rate of return in Australia associated with the completion of Bachelors degrees for a range of fields of study over the business cycle. The results show that for the average person there are strong incentives to complete these degrees, and the private rate of return compares favourably with the real long term real bond rate. However, there are considerable differences in rates of return according to gender and discipline of study. There also appear to be important business cycle effects on the rate of return to a university degree.

JEL Classification: J240, J440, J480

1. Introduction

In recent years Australia has gone through a considerable change in economic activity, starting in 1991 with a recession and ending in 2006 with a boom. These changes in economic activity coincide with the Census of Population of Housing (Census) years, conducted by the Australian Bureau of Statistics in 1991, 1996, 2001, and 2006. Evidence of the business cycle is given in figure 1 which shows the unemployment rate for the period using estimates from both the Labour Force Survey and from the Census. The unemployment rate is a good indicator of the level of economic activity taking in the labour market (Lewis *et al.*, 2010). Figure 1 shows the unemployment rate from the Labour Force Survey, for December 1991 at 10.3 per cent (recession), 1996 at 8.5 per cent (recovery), 2001 at 6.6 per cent (expansion), and 2006 at 4.6 per cent (boom). The unemployment rates from the Censuses are also shown and although they differ marginally the two sets of estimates clearly indicate that the Census periods correspond to phases of the business cycle.

Figure 1 - Unemployment rate, per cent, 1991-1992



Source: Australian Bureau of Statistics, The Labour Force, Cat No. 6202.0 and Australian Bureau of Statistics, 1991, 1996, 2001 & 2006, Censuses of Population and Housing.

The business cycle affects the labour market in terms of both wages and unemployment. At the bottom of the cycle, business cycle effects are concentrated on the unskilled, increasing unemployment and the competition for jobs. Lewis (2006) suggests the effects of a recession are disproportionately larger for unskilled workers compared with the skilled and thus likely to influence the relative income between unskilled and skilled labour. At the top of the cycle, as the pool of unskilled labour has dried up, the business cycle effects are concentrated on wages putting pressure on wages to rise. If all other effects were held constant it would be expected that, on the one hand, the private rate of return to a degree would be greatest during an economic downturn as the unemployment rate of the unskilled would increase, relative to university educated, and relative wages of unskilled would fall. On the other hand, the returns to a degree would diminish at the top end of the business cycle as unemployment decreases and the relative wages of the unskilled increase.

This story is complicated however by the long-term structural changes which has taken place in the Australian labour market over the last few decades changing the demand for skills. In 1975, services accounted for just over 50 per cent of all jobs, but by 2010 the service sector accounted for over 70 per cent of all jobs (ABS, 2010). By contrast, manufacturing's share of total employment almost halved over the same period, to less than 10 per cent. There were similar reductions in the relative shares of jobs in the 'industrial' services such as electricity, gas and water. Structural change has increased the number of jobs in the service sector which values skills that are developed in universities such as knowledge, communication and cognitive skills (Kelly and Lewis, 2006). Technological change, driven by the rapid uptake of Information and Communication Technologies (ICTs) investment, affects the demand for skills directly by increasing demand for ICT related skills and indirectly through

the enabling effects of ICTs (Kelly, 2007). Kelly and Lewis (2010) found that while the economic recovery period of 1991 to 1996 was characterised by skill changes resulting from structural change, for the recovery and boom periods technological change was the main influence on skills change.

While there is a considerable body of research on the returns to education, currently there is only a scant literature available on the business cycle effects upon the private rate of return to higher education. This is despite the expectation that the business cycle would not have neutral effects on participants in the labour market, but would have differential effects on workers according to their degree of skill. People deciding about going to university need to be aware of business cycle effect on their expected wages. Policy makers in choosing the level of public subsidy to degree education need to be aware that the returns to higher education vary over time for a number of reasons including the effects of the business cycle.

Daly and Lewis (2010) showed that during the recession and subsequent recovery up to 2001 there was an increase in the private rate of return for university degrees. However, this declined during the boom in 2006. They suggest that it may be due to strong growth in the economy over that period that raised the relative income of year 12 completers. Corliss and Lewis (2011) suggested the business cycle had little impact on the relative income of tradespersons as a whole. However it did effect trade occupations differently and created greater dispersion of income within the trade occupations as the market provided greater rewards for the more highly skilled, best paid tradespersons during the economic boom. Other studies, in the business cycles context, have focused on skills wage differentials. For instance, Reder (1955) examined the cyclicity of wage differentials, his findings suggesting that the aggregate skill premium was countercyclical in the 1930s and 1940s. More recently, Keane and Prasad (1993), Castro and Coen-Pirani (2008), and Lindquist (2004) show that the aggregate skill premium is acyclical. Therefore it is of interest to investigate whether these same phenomena are observable for degree holders. It is this relationship between the business cycle and its impact upon the private rate of return to higher education that is the subject of this paper.

2. General issues in estimating the returns to education

As an investment, the returns to education can be considered from both an *ex ante* and *ex post* position. For instance, a young person completing secondary school must consider the available evidence on the costs and benefits of education before deciding whether to continue to the next level. Part of the return to completing a qualification is the option value it creates for continuing on to the next level of education (Heckman, Lochner and Todd 2005, Wei, 2007). One of the easiest methods for assessing the financial benefits of education is to look at the current income levels of people with given qualifications available in cross section data. There are a number of assumptions that must be made in order to take the incomes of people with a given qualification at all subsequent ages as the expected future income of a person just beginning that qualification. Current skill differentials must be assumed to persist into the future. Each age cohort must also embody the same educational quality and there is always the issue of heterogeneous returns to individuals and the role of uncertainty in actual outcomes.

Actual outcomes may differ significantly from expected ones. Heckman, Lochner and Todd (2005) present evidence of substantial differences in the *ex ante*

and ex post returns to education in the USA. Daly, Fleming and Lewis (2006) show that the ex post returns to higher education for those starting their degrees in Australia in 1986 were higher than was predicted ex ante as the returns to skill grew in Australia over the 1990s. The methods described below have been applied empirically to cross section data and the assumptions involved in this methodology need to be borne in mind when considering the results. The alternative of calculating the ex post return to education at the end of working life requires over 40 years of data and is of little assistance to someone in making an initial investment decision.

Another major issue arising in estimating the returns to education is the impact of any ability biases on results. The difficulty rests with measuring the effects of ability on income independent of education levels (Wei, 2008). It is often assumed that natural ability and educational attainment are positively correlated but it is possible that the correlation goes the other way with the more able leaving education in pursuit of income opportunities while those with lower ability continuing in the system (Leigh, 2008). Leigh and Ryan (2008) in examining the returns to schooling estimated that between one-tenth and one-fifth of the return to schooling in studies is due to ability bias, but this finding is of only limited use in suggesting an estimate for university education. However, many US studies summarised by Card (1999 and 2001) show that ability biases to estimates of the return to education are not large.

The role of family background in the returns to education has also been discussed in the literature as it is likely to confound the returns to education. Weale (1993), for example, reports British results which show that once the occupation of the parents is taken into account, the private return to an additional year of education is lower for people from a higher occupational background than for those from less privileged backgrounds.

The financial returns to education will also be affected by the extent to which individuals participate in paid employment. This has particular implications for the returns to education identified for women who typically have some time out of the labour force while they raise a family. It is also important for other groups such as Indigenous Australians who may have a marginal attachment to the labour force. Leigh (2008) draws an important distinction between the productivity effects of education as measured by changes in the hourly wage and the participation effect which is reflected in higher annual incomes as the more educated are less likely to spend time out of the labour force than the less educated.

Another notion relevant to the study of the returns to education is the growth in participation in education. With the increasing numbers of university graduates, it is possible that the average natural ability of students may have decreased over time (Wei, 2008). In this context the distinction between the average return to tertiary education and the return to the marginal student is important.

The principles of rate of return analysis are well known in labour economics and the literature dates back to the late 1950s (Becker, 1960; Schultz 1961). The private rate of return is the discount rate which makes the net present value (NPV) of an investment zero. An alternative (equivalent) method is to specify a discount rate and calculate the NPV of the future income stream net of costs. The decision rule is then to invest where the NPV is positive. In the case of the returns to education, the NPV of an investment is the difference between the discounted present value of lifetime monetary benefits from obtaining an additional qualification or years of education and the costs incurred in this investment.

This method calculates an average rate of return for graduates as a whole. Given the heterogeneity among individuals facing different costs and benefits, the average may not be a good guide to the expected rate of return to any given individual. From a policy maker's point of view, it does not address the question of the return to education for the lowest paid graduate. This paper will attempt to throw light on this question by examining the rate of return for those graduates receiving relatively low income compared to the average graduate.

There remain other limitations to this methodology. There is still the problem that it is difficult to capture the 'pure' effect of education on income because of the correlation between educational outcomes and ability and family background factors. Factors such as the current state of the business cycle, self selection of individuals into the level of education that is most likely to produce the highest returns for them and the limitations outlined earlier relating to the use of cross section data remain important considerations.

It is possible to refine the calculations to test different assumptions that have been made. Daly and Lewis (2010) for example, present private rates of return using different assumptions about the length of a degree, student income while studying, the timing of HECS payments and the absence from the workforce by women for several years sometime during their careers. It would also be possible to make some adjustments to these estimates in the light of the available evidence on the effect of ability on income.

There have been a number of Australian studies of the private rate of return to investment in an undergraduate degree over the past thirty years. Differences in the underlying assumptions and methodologies of these studies make direct comparisons difficult, but there is general agreement that investment in an undergraduate education is highly profitable from an individual viewpoint (Miller, 1982; Maglen, 1994; Daly and Jin, 1997; Chapman and Salvage, 1997; Borland *et al.*, 2000; Borland, 2001; Larkins, 2001; Daly *et al.*, 2004; Lewis *et al.*, 2004; Leigh and Ryan, 2008; Leigh 2008; Daly and Lewis, 2010; Wei, 2010).

In this paper we are specifically interested in the extent to which the returns to high levels of skill are influenced by the business cycle. With a scarcity of research on this it is the aim of this paper to partly rectify this.

3. Assumptions of this study

There are a number of key assumptions which must be made in order to calculate the private rate of return. These include the following:

- The length of the degree and therefore the period for which income is foregone,
- Whether students earn any income while studying,
- The size of direct costs including the purchase of books and equipment and fees,
- The size of any adjustment for ability or other unmeasured characteristics which are likely to affect the rate of return.

The following discussion outlines the assumptions made in the base case reported here. The results of further calculations to test the sensitivity to these assumptions will be reported later. The data used for the income calculations are from

the 1991, 1996, 2001 and 2006 Censuses of Population and Housing. The following 12 fields of study were identified: Humanities, Science, Allied Health, Mathematics and Statistics, Information Technology, Engineering, Architecture, Medicine, Nursing, Dentistry, Education and Visual and Performing Arts.

In the base case for a Bachelor degree, the length of the degree is assumed to be three years for Humanities, Science, Mathematics and Statistics, Information Technology, Nursing and Visual and Performing Arts; four years for Allied Health and Engineering; and five years for Architecture, Medicine, and Dentistry. There have been some recent changes in the configuration of the qualifications required to practice in some of these professions. Medicine is now a post-graduate qualification at some universities and Architecture has changed from a five year undergraduate degree to a three year undergraduate degree followed by a two year Masters. As most of the current holders of these qualifications completed their degrees under the earlier system as undergraduate degrees, this assumption has been applied to all graduates in these fields of study. While the aggregated groups of Humanities and Science are homogenous in the minimum length of time required to complete a degree, Allied Health contains some variation within. Out of the seven sub-fields of study identified in this category, four fields require four years to complete (Radiography, Rehabilitation Therapies, Complementary Therapies, and Pharmaceutical), two fields take three years to complete (Public Health and Other Health) and one field of study takes five years to complete (Optical Science).

To carry out the analysis, special tabulations of median income by qualification for each age between and including 18 to 64 years were prepared from the 1991, 1996, 2001 and 2006 Censuses. These incomes are the medians for all people with a given qualification in an age category and all labour market states are included; full and part-time employed, unemployed and not in the labour force. They therefore reflect the different employment outcomes for graduates compared with Year 12 completers and males compared with females as well as any income differences that exist within a particular labour force status. A simple regression relating median income to age and age squared was estimated to provide a smooth series for median incomes at each age. Net incomes were then calculated using the 1990/91, 1995/96, 2000/01 and 2005/06 income taxation rates.

The results presented here are based on cross-sectional data from the Censuses and, therefore, make the assumption that the future income stream of an 18 year old choosing between undertaking a degree or leaving the education system at the end of Year 12 is best represented by what people of differing ages with different levels of qualifications are currently earning. Due to the change in the Census question relating to highest level of schooling attained, the 1991 and 1996 'age left school equals 18' is taken to be equivalent of 'highest level of schooling completed equal's Year 12 or equivalent' in 2001 and 2006. The foregone income of undergraduates were assumed to be the median income of a high school graduate.

The base case is the simplest case which can be modified to test the sensitivity of results to changes in assumptions. It assumes that university students do not earn income while studying and that there are explicit costs for students; undergraduates incur \$1,720 per year (in 2006 dollars) in direct study cost. These direct cost estimates were taken from the Australian Universities Student Finances Report 2006 (AVCC 2007). In addition students are assumed to pay upfront the student fees applicable

for each field of study and year at the relevant rate (i.e. 1991, 1996, 2001, or 2006) of the Higher Education Contribution Scheme (HECS) charge and collect a 20 per cent discount for paying fees upfront. The base case results do not make any adjustment for ability or other unmeasured characteristics which may affect the private rate of return.

4. The labour market for graduates

Table I shows the number of graduates per 1000 population over 15 years of age increasing dramatically over the period 1991 to 2006 with nearly an 80 per cent increase in the proportion of graduates from 87 graduates per 1000 in 1991 to 156 graduates per 1000 in 2006. This increase in the number of graduates per 1000 population happened at the same time there was considerable population growth in the order of 22 per cent during the period 1991 to 2006. Both of these factors have significantly increased the number of graduates in Australia.

Holding everything else constant, such a large increase in the number of graduates in the Australian population over 15 years of age, would be expected to reduce the relative median incomes of graduates compared to those holding a year 12 certificate. However, this is not the case as shown in the table. In fact the earnings ratio of graduates to year 12 certificate holders increased from 1991 to 2001 for males and while females did see a fall from 1991 to 1996 the earnings differential became larger from 1996 to 2001.

As discussed earlier the business cycle could partly explain the trend in the earnings ratio of graduates to year 12 certificate holders. At the bottom of the cycle, business cycle effects are concentrated on the unskilled, increasing unemployment and the competition for jobs reducing relative wages. At the top of the cycle, as the pool of unskilled labour has dried up, the business cycle effects are concentrated on putting pressure on relative wages of the unskilled to rise. Table 1 shows a considerable fall in the earnings ratio for both male and female graduates from the 2001 expansion to 2006 top of the cycle. While for females the highest earnings ratio is during the 1991 recession as predicted, for males the earnings ratio of the 1991 recession is not the highest point and in fact the earnings ratio grows up until its 2001 peak at the expansion phase of the business cycle. No doubt there have been cyclical changes along side longer term structural and technological changes.

Table 1- Summary statistics on the graduate labour market in Australia

	1991	1996	2001	2006
Population 15+	13,085,092	14,040,303	14,856,774	15,918,082
Graduates/1000 population	87	103	146	156
Males				
Median income - graduates	\$47,273	\$53,159	\$67,729	\$62,921
Median income - year 12	\$25,978	\$28,598	\$34,148	\$42,356
Ratio graduate/year 12	1.82	1.86	1.98	1.49
Females				
Median income - graduates	\$34,117	\$37,632	\$46,108	\$42,259
Median income - Year 12	\$18,410	\$21,894	\$25,765	\$27,164
Ratio graduate/year 12	1.85	1.72	1.79	1.56

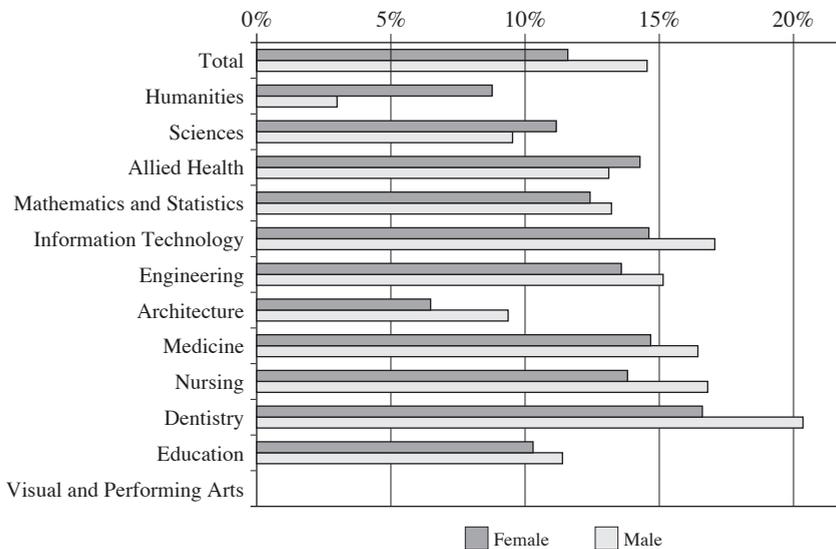
Source: Daly *et al.*, (2006); Australian Bureau of Statistics, 1991, 1996, 2001, 2006 Censuses of Population and Housing, unpublished.

However, as stated before, the graduate labour market is further complicated by structural and technological change taking place during the same period. As discussed earlier, both structural and technological change have increased the demand for graduates in Australia.

5. Results

We begin by comparing the rates of return for males and females in the most recent year for which we had data, 2006, to provide a benchmark for looking at changes over time. Table 1 shows quite clearly there is substantial incentive for private individuals to attain a Bachelor degree in most disciplines and that there is considerable variation between different fields of study. It also shows that there are important differences in rates of return according to gender. The rate of return in 2006 for all graduates was 12 per cent for females and 15 per cent for males. Clearly, failure to account for these differences can be very misleading. The highest rates of return for men were in Dentistry, Nursing, and Information Technology. For women the highest rates of return were in Dentistry, Medicine, and Information Technology. The lowest rates of return for both males and females were in the Visual and Performing Arts (negative rate of return), Humanities and Architecture. In most cases but not all, the private rates of return were slightly higher for males than for females, most notably in Dentistry and Nursing. On the other hand females with a Humanities qualification received a private rate of return of nine per cent compared to three per cent for their male counterparts.

Figure 2 - Private rates of return by gender, 2006

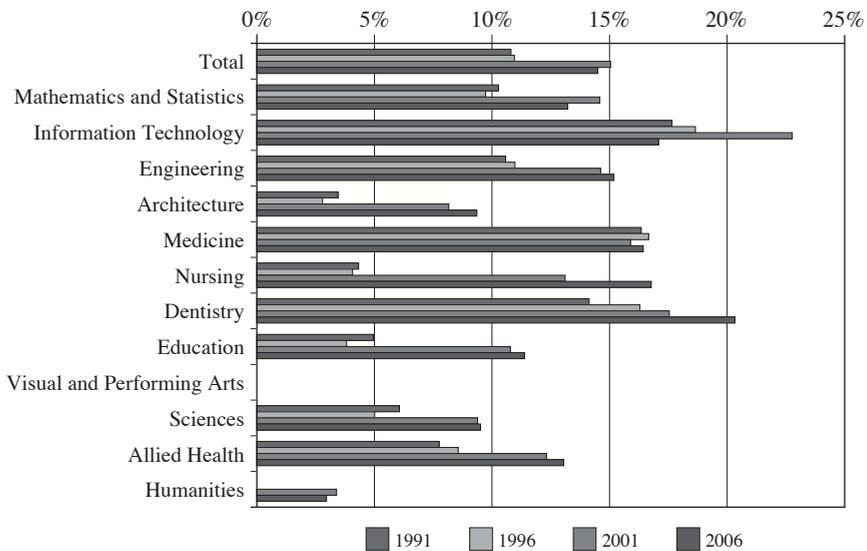


Source: Australian Bureau of Statistics, 2006 Census of Population and Housing, unpublished.

6. Business cycle effects

Turning now to the effects of the business cycle, the Censuses provide unique data covering different stages of the business cycle from 1991, the middle of a recession, 1996, the recovery, 2001, the boom and 2006, labour shortages. Figures 3 and 4 show the private rates of return for males and females over the business cycle.

Figure 3 - Private rates of return for males, 1991–2006



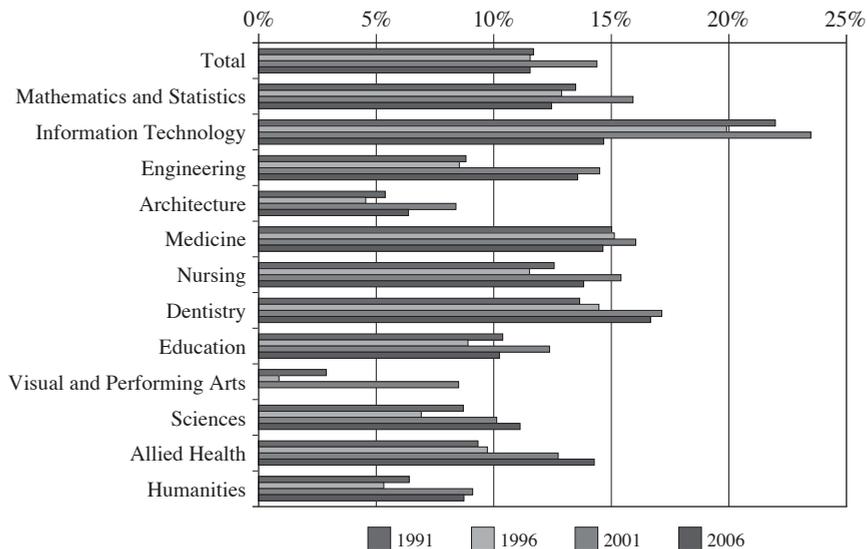
Source: Australian Bureau of Statistics, 1991, 1996, 2001, 2006 Censuses of Population and Housing, unpublished.

The private rate of return for males, shown in figure 3, experienced a dramatic increase between the 1996 recovery to 2001 expansion phase of the business cycle for many of the fields of study under investigation. During this time the rate of return for the whole sample increased from 11 per cent in 1996 to 15 per cent in 2001. This was most pronounced in Nursing, Education and Mathematics. Other degrees recorded more modest increases in the private rate of return, with the exception of Medicine observing a slight decrease. With the exception of Information Technology, where the rate of return fell sharply between 2001 to 2006, all the fields of study recorded an upward movement or remained relatively constant during the 2001 expansion to 2006 boom phase of the business cycle. While there is considerable variation in the private rate of return between the degrees shown here, the business cycle appears to affect them in a fairly consistent manner.

Figure 4 suggests a slightly different story for women than for their male counterparts over the business cycle. Consistent with males, female degree holders increased their private rate of return from 1996 to 2001, although it was not as pronounced as for males. The sample total rate of return increased from 12 per cent

in 1996 to 14 per cent in 2001. However, for females, the rate of return fell between 2001 and 2006 back to the 1996 level unlike males which only saw a slight fall in rate of return over this period. The fields of study having the greatest increases in the private rate of return for females were Visual and Performing Arts and Engineering. A further difference was that the downward adjustment in the female private rate of return occurring between 2001 and 2006 was more dramatic than for their male counterparts and affected more fields of study than just Information Technology, including Mathematics and Education with minor reductions noted in some of the other fields of study.

Figure 4 - Private rates of return for females, 1991-2006



Source: Australian Bureau of Statistics, 1991, 1996, 2001, 2006 Censuses of Population and Housing, unpublished.

Perhaps the most interesting results are the dramatic variation in the private rate of return for holders of Information Technology degrees. It is possible that the raised expectations of potential students in 2000 due to the very high private rate of return of Information Technology degrees compared with other fields of study created an oversupply of Information Technology graduates. This occurred at a time when demand was coming off a high in 2006 putting downward pressure on wages thus dramatically reducing the private rate of return for Information Technology degree holders.

7. Low income degree holders

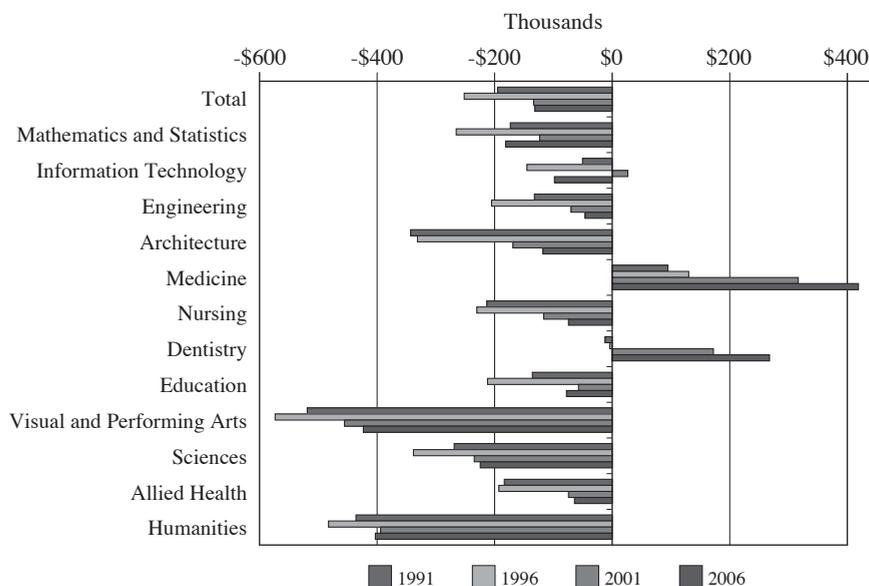
So far the focus has been on the median income of individuals attaining a bachelor degree to understand the returns to investment in education and training for the typical degree holder. We now examine the returns for those graduates who are less well paid, specifically the lowest 20 per cent of graduates (20th percentile). Here as in the base

case the opportunity cost of study is taken to be the median income of the Year 12 certificate holders. In this particular case the results of the private rate of return are nearly all negative and, therefore, have been omitted from the paper. That is, the lowest paid university graduates would be better off not going to university, in all stages of the business cycle.

However, the net present value can be calculated and the estimates are presented in figures 5 and 6. As explained earlier in the paper the net present value is calculated with a real rate of interest of two per cent which is approximately the long run real bond rate. The conclusions are not changed much by the choice of interest rate within reasonable bands.

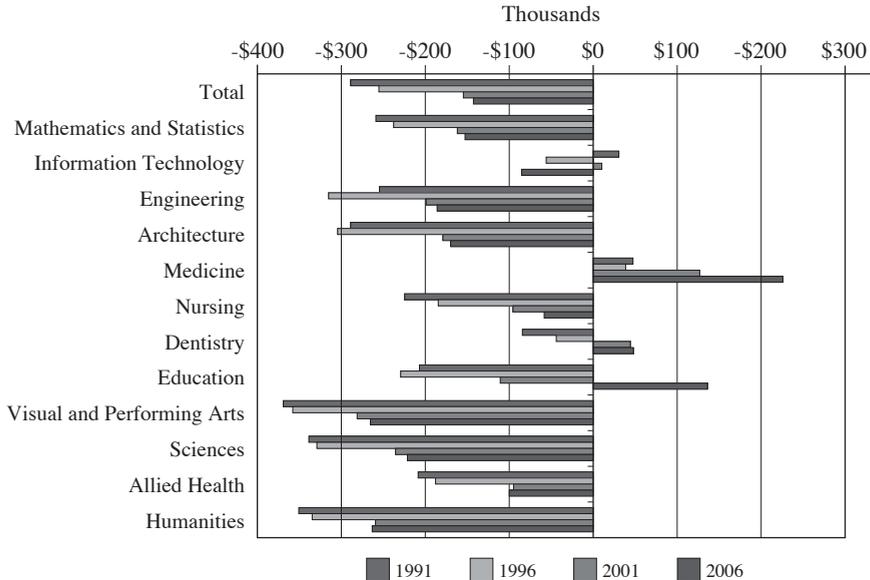
Clearly for most of the worst paid bachelor degree holders the net present value of their lifetime income would be greater leaving school after graduating from Year 12 and obtaining full-time employment. As shown in figure 5 the sample total suggests in 2006 the worst paid graduates are \$132,210 worse off compared to those with only a year 12 certificate. However, this loss in lifetime income has been reduced considerably from its peak in 1996 of \$253,457. In 2006 for men in Medicine and Dentistry, however, the rewards for the lowest paid obtaining a degree were still worthwhile and for lower paid women university graduates there is still incentive to study Medicine, Dentistry and Education.

Figure 5 - Net present value of the 20th percentile of males, 1991-2006



Source: Australian Bureau of Statistics, 1991, 1996, 2001, 2006 Censuses of Population and Housing, unpublished.

Figure 6 - Net present value of the 20th percentile for females, 1991-2006



Source: Australian Bureau of Statistics, 1991, 1996, 2001, 2006 Censuses of Population and Housing, unpublished.

Over time the incentive for the worst paid degree holders remains fairly consistent. Men had a small but positive net present value in 2001 and females observed a small but positive net present value in 1991 and 2001, however, the net present value does not remain positive for the entire period under question. Additionally the only positive net present value for women studying Education took place in 2006. These results suggest that for the lowest paid men and women graduates only Medicine consistently offers any incentive to undertake the training over the entire period. If, as a potential university student, you knew you were going to be a low earner then you would be best not to study a university degree. There is a big risk involved with university education including the possibility you might not complete and that you might not earn much as a consequence of completion.

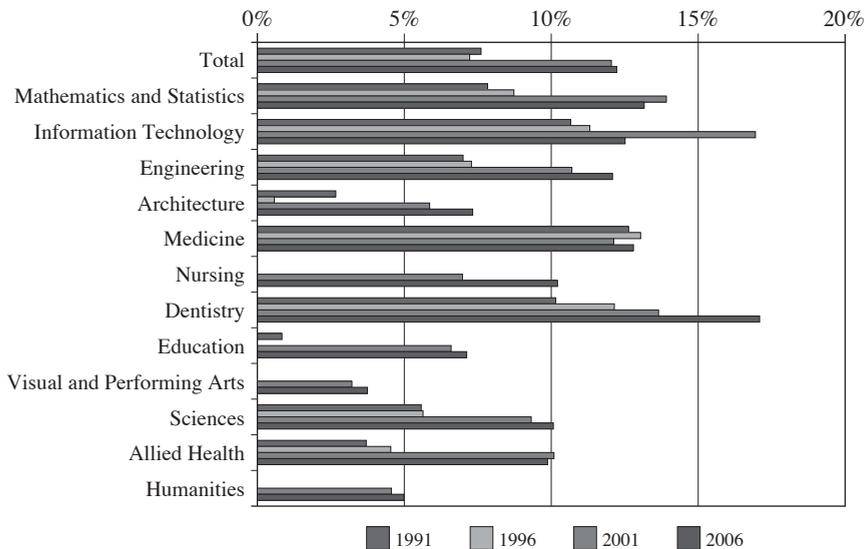
9. Degree holders employed full-time

In the base case everyone is included in the private rate of return estimates no matter how much they work or even if they do not work at all. There are two effects of higher education for individuals - they are higher wages and lower incidence of unemployment. By looking at only those working full-time the unemployment effect can be held constant and the effect upon wages isolated. For people from some fields of study unemployment or a greater incidence of casual work may significantly affect the returns to a degree. Also, many (perhaps most) women leave the labour force for periods of time to look after children. Therefore it may be useful to control for this by

selecting only those working full time. Both the university graduates group and the comparator group (Year 12 graduates) only include those working full-time. Figures 7 and 8 show the private rate of return estimates for individuals with a bachelor degree and who are employed full time. The business cycle effects would be expected to be greater when examining all graduates rather than those employed full time.

Overall the recession through to the boom phase of the business cycle has increased the rate of return to male degree holders that are working full time as shown in figure 7. The largest change occurred during from 1996 (recovery) to 2001 (expansion) phase of the business cycle with an increase in the rate of return for the sample total of five percentage points. For the various fields of study, the most remarkable of these increases was found in the Information Technology, Allied Health, Architecture and Mathematics up five per cent from 1996 to 2001. There were some notable exceptions to this though - those with an Information Technology degree recorded a significant reduction in the rate of return to their degree dropping of four percentage points from 2001 to 2006 despite their impressive gain in the previous five year period. The results imply that the business cycle has a great effect on wages not just employment.

Figure 7 - Private rates of return for full-time workers, males, 1991-2006



Source: Australian Bureau of Statistics, 1991, 1996, 2001, 2006 Censuses of Population and Housing, unpublished.

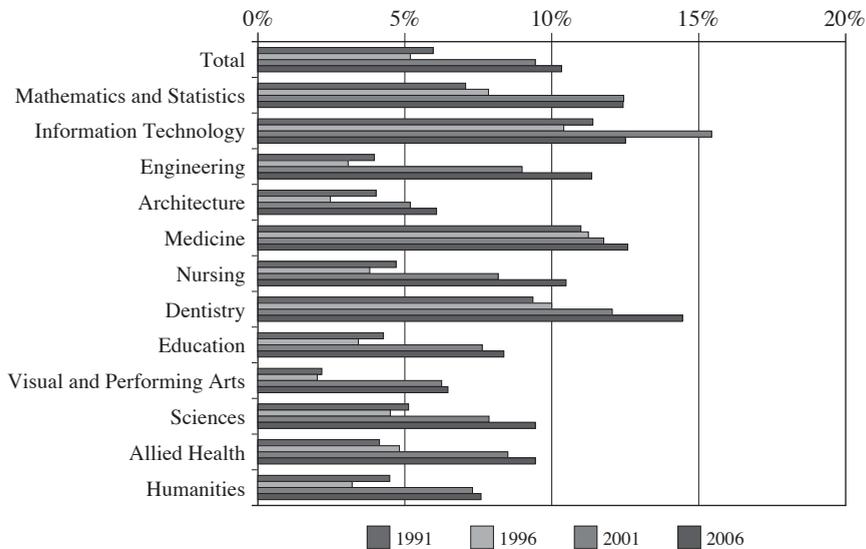
For full time female degree holders shown in figure 8 the recession through to boom phase of the business cycle had a similar effect on the rates of return for female degree holders as experienced by male degree holders. The largest change occurred from 1996 (recovery) to 2001 (expansion) phase of the business cycle with an increase in the rate of return for the sample total of three per cent. For the various fields of study, the most remarkable increases in the rate of return were for those holding a

degree in Information Technology and Engineering. Although, there was a fall in the private rate of return for Information Technology degree holders from 2001 to 2006, for most of the other fields of study, they observed a further increase in their private rate of return from 2001 to 2006. This is in contrast to the effect the boom had for all women where a reduction in the private rate of return was commonplace among the various fields of study.

This can be explained by distinguishing between salary effects and employment effects. On the one hand, when examining women working all hours a boom in the economy favoured part-time employment for women causing the relative wages of unskilled women to increase. On the other hand, when examining only women working full-time, employment effects are eliminated and only a pure salary effect remains. Thus, during the boom there was a fall in the private rate of return for women degree holders when examining all women, and an increase in the private rate of return for women degree holders when considering only women working full-time.

Interestingly, controlling for hours worked had a much greater impact in reducing the private rate of return for females than it did on males. This suggests unemployment and child raising impacts upon female income considerably more than it does on males.

Figure 8 - Female private rates of return for full-time workers



Source: Australian Bureau of Statistics, 1991, 1996, 2001, 2006 Censuses of Population and Housing, unpublished.

Additionally after controlling for hours a considerable reduction in the rates of return to degree holders was observed. It is well known that there are significantly different unemployment rates for people with different qualifications (see for instance, Lewis, 2006). Those holding a degree have on average a considerably reduced

incidence of unemployment when compared with those whose highest qualification is a year 12 certificate. Figures 7 and 8 are perhaps evidence of this. It would be expected that those with a year 12 certificate have higher rates of unemployment compared to degree holders. This unemployment effect would cause the median income of year 12 certificate holders to be lowered by more than degree holders. By removing the unemployed from the sample reduces the impact unemployment has on income. As expected the results show a reduced rate of return to degree holders when sampling only those working full time. There is evidence that women shift between not in the labour force and part-time employment when the labour market is good (Norris *et al.*, 2004). Also you would expect a reduction in the rate of return when more employment opportunities are available.

10. Conclusion

This paper presents estimates of the rate of return to Bachelor degrees in Australia over each phase of the business cycle. The results show that, generally, a degree is a profitable investment for individuals. Various assumptions have been adopted in order to provide a sensitivity analysis of the robustness of these estimates and importantly whether or not these results remain consistent over time.

While returns to university education are generally high, there are large differences between disciplines. For instance, the rates of return to a Bachelor degree are particularly large in some fields of study notably Dentistry, Medicine and Information Technology. The results show that the completion of a Visual and Performing Arts degree is not a good financial investment for either men or women. Also, not all students receive considerable benefits from obtaining a university degree. For instance, many of the lowest paid university graduates would have done better finishing their education at Year 12 and entering full-time employment. The results shown here also suggest that this conclusion is robust over time.

It is interesting that the private rate of return was at its lowest during the bottom of the business cycle. This is against expectations as typically the contractionary phase of the business cycle would be expected to disproportionately impact upon the lower skilled (Year 12 certificate holders) in terms of both employment status and the median wage thus decreasing the opportunity cost of study and increasing the private rate of return. It is also possible that the large increase in supply of graduate labour in the post Dawkins era coinciding with the downturn to some extent outweighed the business cycle effect.

Additionally, it would be expected that at the top of the business cycle the private rate of return to a degree would diminish as the pool of unskilled labour dried up along with a decreasing unemployment rate putting pressure on wages to rise disproportionately faster for the least skilled. Another reinforcing factor expected to reduce rates of return to university education would have been the huge growth in supply of university graduates post 1990. This is only really evident for Information Technology degrees where a dramatic increase in the private rate of return in the previous period may have caused an oversupply of undergraduates by 2006 which resulted in a large fall in the private rate of return during the boom period. For most degrees the impact of the business cycle on rates of return have been pro-cyclical.

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