How much is it worth? New estimates of private returns to university education in Australia

Final Report

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Abstract

This study provides new estimates of the private returns to higher education in Australia. We undertake the analysis using a longitudinal model, which allows us to consider important aspects of earnings dynamics that are typically ignored by conventional modelling techniques. Our findings indicate that lifetime earnings of men with a postgraduate degree are about 75 per cent higher than those of men with Year 12 and below. Women with a postgraduate degree earn about 45 per cent more over their lifetime than women with Year 12 and below. We also find that lifetime earnings of women with a Bachelor or Honours degree are almost as high as those of women with a postgraduate degree. We further observe that women with Year 12 and below have no financial benefits from investing in vocational training.

This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the author and should not be attributed to either DSS or the Melbourne Institute.

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Executive summary

Knowledge about the private returns to education are relevant for the decision of individuals to invest in higher education and may have important implications for the design of education policies. Existing studies typically use cross-sectional data to estimate the private returns to education (see, e.g., Daly et al., 2010; Norton, 2012). Unfortunately, cross-sectional studies do not separate age and time effects, i.e. they assume that, for example, the earnings of an average 25-year old university graduate in 30 years will be as high as today's earnings of an average 55-year old university graduate. Cross-sectional studies also assume that people who were observed at one point in time will retain their position in the earnings distribution for the rest of their working lives. In reality, however, individual earnings may change considerably over time for various reasons (including illness, higher duties, bonuses, overtime, ability, talent, motivation, etc.).

This study uses longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, which follows a representative sample of the Australian population over time, to provide new estimates of the private returns to higher education in Australia. The analysis focuses on the estimation of *returns*, i.e. the private benefits from higher education. Specifically, we calculate earnings differentials between individuals with higher education and individuals with Year 12 and below to derive the present value of lifetime earnings resulting from higher education.

Our main findings are as follows:

- Lifetime earnings of men with a postgraduate degree (Masters or Doctorate) are about 75 per cent higher than those of men with Year 12 and below. Men with a Bachelor or Honours degree earn about 50 per cent more than men with Year 12 and below.
- The returns to education of women with a postgraduate degree are about 45 per cent, and those of women with a Bachelor or Honours degree are about 40 per cent. Women with Year 12 and below have no financial benefits from investing in vocational training.

1. Introduction

There are many reasons why people choose to pursue higher education in Australia. Some people want extra qualifications to help them advance in a specific career path. For many others – especially younger cohorts – higher education is very attractive because they are not ready to enter the 'real' world of full-time work.

A decision to undertake further studies involves opportunity costs and trade-offs: we spend years at an education institution to get the desired qualification(s); we could have started to work and earn money if we were not studying; we have to pay for those textbooks when we are studying.

The list of costs associated with undertaking further education goes on but these investments are expected to reap returns in the future. According to the latest Education at a Glance published by the OECD last year, on average having a tertiary education qualification translated into 35 per cent higher relative earnings of 24-64 year olds in Australia. People with higher levels of education are also more likely to be employed, and remain employed, and have more opportunities to advance in their career.

Knowledge about the private returns to education are not just relevant for the decision of individuals to invest in higher education but may also have important implications for the design of education policies. Studies that estimate the private returns to education in Australia focus exclusively on analysing a 'snapshot' of the population at one point in time, i.e. they either use cross-sectional data (see, e.g., Daly et al., 2010; Norton, 2012) or employ longitudinal data to perform a cross-sectional analysis (e.g., Leigh and Ryan, 2008; Marks, 2008).

Unfortunately, cross-sectional studies ignore important dynamic aspects of earnings because they assume that people who were observed at one point in time will retain their position in the earnings distribution for the rest of their working lives. In reality, however, individual earnings may change considerably over time for various reasons. Empirical studies suggest that observed characteristics (such as education and labour market experience)

explain a relatively small proportion of earnings variability (see Higgins and Sinning, 2013). Unobserved differences can result from temporary variation (due to illness, higher duties, bonuses, overtime, etc.) or permanent variation (such as ability, talent, or motivation).

This study generates new estimates of the private returns to higher education in Australia, using longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, which follows a representative sample of the Australian population over the time period 2001-2012. The data allow us to compare the estimates obtained from a cross-sectional model to those of a longitudinal model that considers both age and time effects and that accounts for temporary and permanent variation in individual earnings over time. Unfortunately, the use of HILDA data limits our analysis to relatively small samples, and, in contrast to (cross-sectional) Census data, HILDA does not permit a disaggregated estimation of private returns to education by field of study. However, the focus on HILDA data allows us to understand the relevance of longitudinal aspects when estimating private returns to education of men and women in Australia.

The study focuses on the estimation of private *returns*, i.e. the private benefits from higher education. Specifically, we compare earnings of individuals with higher education and with Year 12 and below to calculate the present value of lifetime earnings resulting from higher education. A complete analysis of the value of higher education would involve a comparison of the benefits to the costs associated with higher education. Such a cost-benefit analysis is beyond the scope of this study, which intends to understand the implications of using alternative methodologies when estimating the private returns to education.

We find that lifetime earnings of men with a postgraduate degree (Masters or Doctorate) are about 75 per cent higher than those of men with Year 12 and below. Women with a postgraduate degree earn about 45 per cent more over their lifetime than women with Year 12 and below. Our findings also reveal that lifetime earnings of women with a Bachelor or Honours degree are almost

as high as those of women with a postgraduate degree. We further observe that women have no benefits from investing in vocational training.

The remainder of this study is organized as follows. Section 2 provides an overview of the literature on the estimation of private returns to education. Section 3 describes the data and provides some descriptive statistics. The methodology is explained in Section 4. The main results are discussed in Section 5. Section 6 concludes.

2. The literature on private returns to education

The economic literature on the estimation of the returns to education is motivated by the human capital framework (Becker, 1964), which considers education as an investment in human capital. An extensive literature across many countries and time periods has shown that highly educated people generally earn more than less educated people (see Ashenfelter et al. (1999) and Psacharopoulos and Patrions (2004) for surveys of the literature).

Most empirical studies have typically used the human capital earnings function derived by Mincer (1974) to estimate the returns to education. The human capital earnings function relates the (logarithm of) earnings to the number of years of education and labour market experience.[1] Education was typically measured in years but many studies have adopted alternative model specifications that take into account that education is better represented by certain degrees rather than the number of years of education (see, e.g., Jaeger and Page, 1996).

The model includes labour market experience to isolate effects of on-the-job training on earnings from the effect of education on earnings. The original human capital earnings function includes a quadratic function of labour market experience to take into account that earnings typically increase at a declining

[1] Appendix I includes a technical discussion of the human capital earnings function.

rate and that increasing labour market experience may even reduce earnings at the end of the working life.[2]

A large strand of the empirical literature on the returns to education has focused on a problem that is caused by unobservable variables that are correlated with education, such as individual ability or talent. The omission of these variables may lead to a bias in the estimated returns to education and numerous studies have employed empirical strategies that allow them to identify the causal effect of education on earnings.[3] On balance, these studies show that the bias caused by unobservable variables is relatively small.

It is important to note that the human capital earnings function ignores the (monetary or non-monetary) costs of education. Monetary costs do not only include direct costs such as fees, books and equipment but also opportunity costs resulting from foregone earnings as a result of spending time in education. Heckman, Lochner and Todd (2005) conclude that non-monetary (psychic) costs of education are substantial, which may explain why many people do not invest in higher education, even if the returns to education are high.

An alternative approach to make inferences about the private returns to education is to calculate the net present value of an investment in education (Becker, 1964; Schultz, 1961). The net present value is the differences between the discounted present value of lifetime earnings and the discounted present value of the costs of investing in education. The calculation depends on a discount rate, which takes into account that the value of present earnings is higher than the value of future earnings.[4]

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[2] It is unclear whether older workers suffer from declining productivity towards the end of their working life or whether the decline in earnings simply reflects different work-leisure preferences and, therefore, reduced hours of work (but at the same level of productivity). Our analysis focuses on the study of hourly wages to address this issue and to facilitate comparisons between male and female workers. Sections 3 and 4 provide a detailed discussion of earnings measures.

[3] These studies have typically employed instrumental variables strategies (Angrist and Krueger, 1991; Card, 1999) or made use of twin studies (Ashenfelter and Krueger, 1994) to identify the causal effect of education on earnings.

[4] Appendix I explains the calculation of the net present value.

The calculation of the net present value of an investment in education is typically based on the comparison of earnings of workers with Year 12 and below and workers who receive tertiary education and face direct costs. Opportunity costs can be obtained by assuming that if individuals with tertiary education had not made the investment, their earnings would be the same as those of individuals with Year 12 and below. The approach requires the collection of data on the direct costs of education and typically ignores potential biases resulting from unobserved factors.

Numerous studies have estimated the private returns to education in Australia and shown that an investment in higher education is highly profitable (see Daly et al., 2010). Leigh and Ryan (2008) employ a human capital earnings function to estimate the returns to education and compared different empirical strategies (instrumental variables and twin studies) to address potential biases caused by unobserved ability. They conclude that the rate of return to an additional year of education, corrected for ability bias, is around 10 per cent.

Daly and Lewis (2010) study the net present value of investing in education and find that this approach produces higher returns to education than the preferred estimate reported by Leigh and Ryan (2008). Wei (2010) compares the returns to education obtained from a human capital earnings function to those of the net present value calculation and finds that the results obtained from the latter approach are higher.

Norton (2012) uses data from the 2006 Census and finds that at the median, lifetime earnings of men with a Bachelor degree are 65 per cent higher than those of men with Year 12 and below. The difference for women at the median is close to 80 per cent. Norton (2012) also studies the range of graduate earnings and concludes that the majority of graduates benefit from university education within each discipline with exception of men studying performing arts.

The economic literature in Australia focuses exclusively on the cross-sectional analysis of private returns to education and ignores dynamic aspects of

lifetime earnings. Unfortunately, age-earnings profiles based on cross-sectional models assume that, for example, the earnings of an average 25-year old university graduate in 30 years will be as high as today's earnings of an average 55-year old university graduate. This assumption may have severe consequences for the estimation of private returns to education.

The aim of this study is to investigate alternative methodologies and to provide up-to-date evidence on the private returns to education. Our analysis contributes to the empirical literature on the private returns to education in two important ways. First, we use hourly wages as an outcome measure to estimate private returns to education because they facilitate comparisons between men and women who exhibit very different levels of labour supply. Instead of using annual earnings (measured in dollars) to calculate lifetime earnings, we use annual averages of hourly wages to study wage differentials (measured in per cent) between different levels of education. The present value of these differentials may be used to calculate private returns to education (measured in per cent). Second, we use longitudinal data to consider both age and time effects (and the interaction between age and time) to predict future wages. Our prediction of future wages also takes into account temporary and permanent variation in individual wage rates over time.

3. Data and descriptive statistics

3.1 Data

Our empirical analysis uses data from the Household, Income and Labour Dynamics in Australia (HILDA) panel for the years 2001-2012. The first wave of the longitudinal survey consisted of 7,682 households and 19,194 individuals. The survey follows these households over time and all adult members of each household are interviewed annually. In 2011, a top-up sample was added to the survey to address sample attrition. The top-up sample will not be considered in our analysis to avoid potential inconsistencies resulting from the consideration of additional households.

The HILDA panel contains information about a range of topics, including individual earnings, educational attainment and labour market experience. In

our cross-sectional analysis, we will compare three earnings measures, which produce slightly different results: hourly wages, weekly earnings and annual earnings. Our longitudinal analysis focuses on hourly wages, which facilitate comparisons between men and women who exhibit very different levels of labour supply.

To obtain representative results for Australia, we do not impose many restrictions on our analysis sample. Most of our analysis is based on an unbalanced panel, i.e. we include individuals who enter a survey household during the survey period. To motivate our dynamic analysis, we use a balanced panel, which only includes individuals who were surveyed in 2001 and who may drop out of the survey before 2012. The balanced panel allows us to study changes in the earnings of the same individuals over time.

We restrict our analysis sample to 25-64 year old persons who are either full- or part-time employed and who report positive annual earnings. We do not consider persons who report (positive or negative) business income to avoid potential biases caused by very high earnings that are not necessarily representative. We also drop the top and bottom 1 per cent of the hourly wage distribution because the dynamic models employed in our analysis are often unable to deal with extreme wage levels.[5]

Our analysis is performed separately for men and women because they are expected to exhibit different returns to education. Unfortunately, due to the relatively small sample of the HILDA panel, we are unable to estimate returns to education by field of study. After dropping individuals who do not report their education and labour market experience, our analysis sample includes 61,520 person-year-observations (31,384 men and 30,136 women) over the

[5] We perform robustness checks to examine the impact of dropping the top and bottom 1 per cent of the wage distribution. Specifically, we estimate our cross-sectional models with and without the sample restriction. The estimates of the restricted models are presented in Tables 3-6. The results of the unrestricted models are provided in Tables A1-A4 of Appendix II. The robustness checks suggest that dropping the top and bottom 1 per cent of the wage distribution does not affect our results qualitatively.

period 2001-2012. We employ person weights provided by HILDA throughout the entire analysis to obtain representative results.

3.2 Descriptive statistics

This section provides a description of the most important variables that we use to perform the empirical analysis. Table 1 includes average levels of education by gender in 2012. We observe that about 6.7 per cent of the male workers and 9.2 per cent of female workers in Australia have a postgraduate degree (Masters or Doctorate).

Female workers are also more likely to have a Bachelor or Honours degree or an Advanced Diploma/Diploma than male workers. The share of female workers with a Bachelor or Honours degree is 22.4 per cent, and the corresponding share of male workers is 17.6 per cent. Advanced Diploma/Diploma holders make up 12.6 per cent of female workers and 10.4 per cent of male workers.

In contrast, men are considerably more likely to have a Certificate I-IV then women. The share of male Certificate I-IV holders is 32.6 per cent, compared to 20.2 per cent of female Certificate I-IV holders. The fractions of male and female workers with Year 12 and below are 32.8 per cent and 35.5 per cent, respectively.

Table 1: Education by Gender, 2012

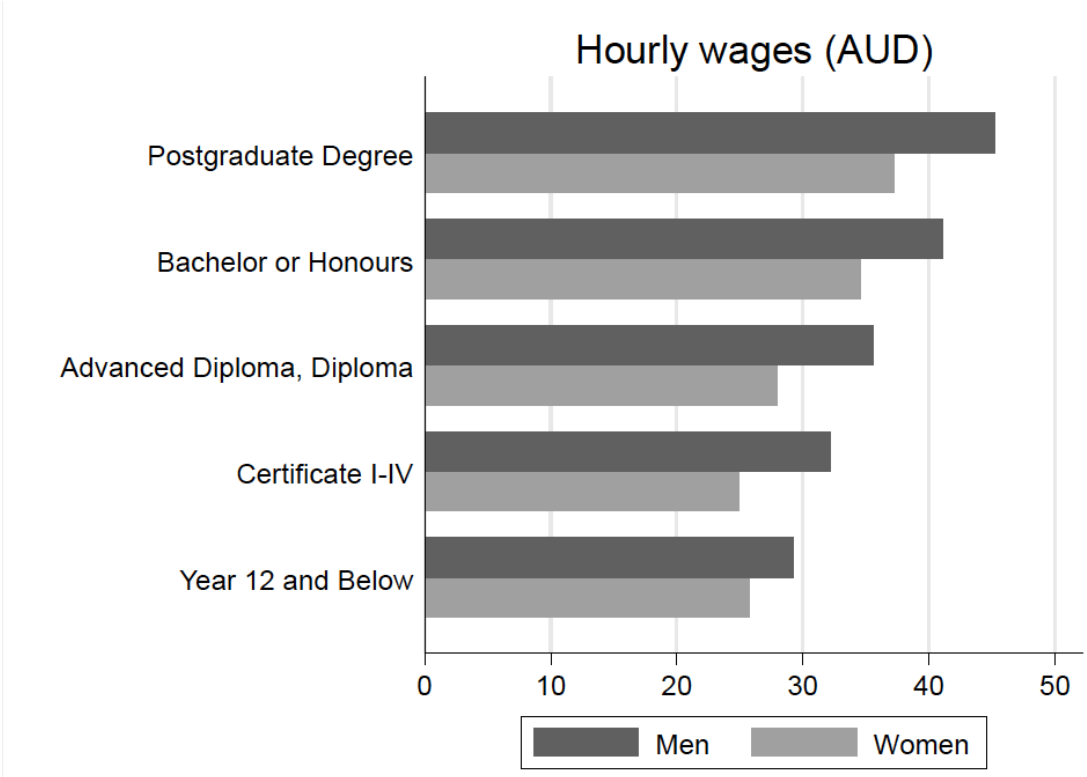
	Men	Women
Postgraduate Degree (Masters or Doctorate)	0.067	0.092
	(0.249)	(0.289)
Bachelor or Honours	0.176	0.224
	(0.381)	(0.417)
Advanced Diploma, Diploma	0.104	0.126
	(0.305)	(0.332)
Certificate I-IV	0.326	0.202
	(0.469)	(0.402)
Year 12 and Below	0.328	0.355
	(0.469)	(0.479)
Education in Years	12.4	12.6
	(1.8)	(2.0)
Observations	2690	2570

Note: Weighted numbers based on weights provided by HILDA. Standard deviations are reported in parentheses.

When comparing the average total number of years of education of male and female workers, gender differences in educational attainment appear rather small. On average, male workers have 12.4 years of education, whereas the average number of years of education of female workers is 12.6 years. These numbers suggest that we cannot simply assume that educational attainment is sufficiently described by the number of years of education. For that reason, we will take into account different levels of education in our empirical analysis.

We may also study the association between educational attainment and earnings of male and female workers. In this section, we compare three types of earnings measures, namely hourly wages, weekly earnings and annual earnings. Figure 1 presents average hourly wages by gender and education in 2012. We find that the average hourly wage of men with a postgraduate degree is about $45. The average hourly wage of women with a postgraduate degree is only $37.

Figure 1: Hourly Wages by Gender and Education, 2012



Note: Weighted numbers based on weights provided by HILDA.

Figure 1 also reveals that workers with higher levels of education earn generally more than less educated workers. Male workers with a Bachelor or Honours degree earn about $41, those with an Advanced Diploma/Diploma earn about $36, average hourly wages of Certificate I-IV holders are about $32, and male workers with Year 12 and below earn about $29 per hour.

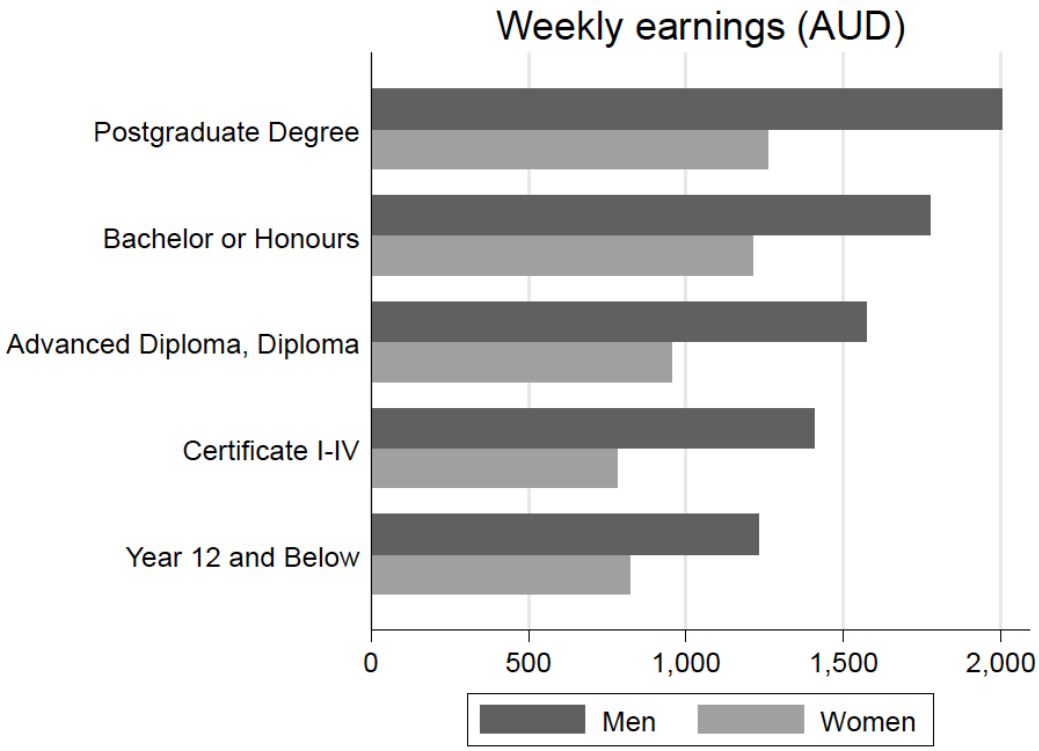
A similar picture emerges when we look at the sample of female workers. Female workers with a Bachelor or Honours degree earn about $35, Advanced Diploma/Diploma holders earn about $28, and Certificate I-IV holders earn on average about $25, followed by female workers with Year 12 and below who earn about $26.

The differences in average hourly wages presented in Figure 1 appear to be relatively small (only a few dollars) but they are in fact quite substantial. In particular, the earnings differentials between male and female workers become more obvious when we take into account that women are considerably less likely to be full-time employed than men. For that reason, we also consider differences in weekly and annual earnings. Figure 2 presents average weekly earnings by gender and education in 2012.

We observe a considerable gender earnings gap along the entire educational distribution. Specifically, we find that men with a postgraduate degree earn on average about $2,003 per week and that weekly earnings of women are only about $1,259.

The earnings gap between male and female workers with Bachelor or Honours degree is slightly smaller (men with a Bachelor or Honours degree earn about $1,774 and women earn about $1,211) and we observe large gaps between male and female workers with Advanced Diploma/Diploma ($1,573 vs. $954) and Certificate I-IV ($1,408 vs. $780). The earnings gap between male and female workers with Year 12 and below is smaller in absolute terms (men earn about $1,231 and women earn about $821) but still substantial in relative terms (women earn more than 30 per cent less than men).

Figure 2: Weekly Earnings by Gender and Education, 2012



Note: Weighted numbers based on weights provided by HILDA.

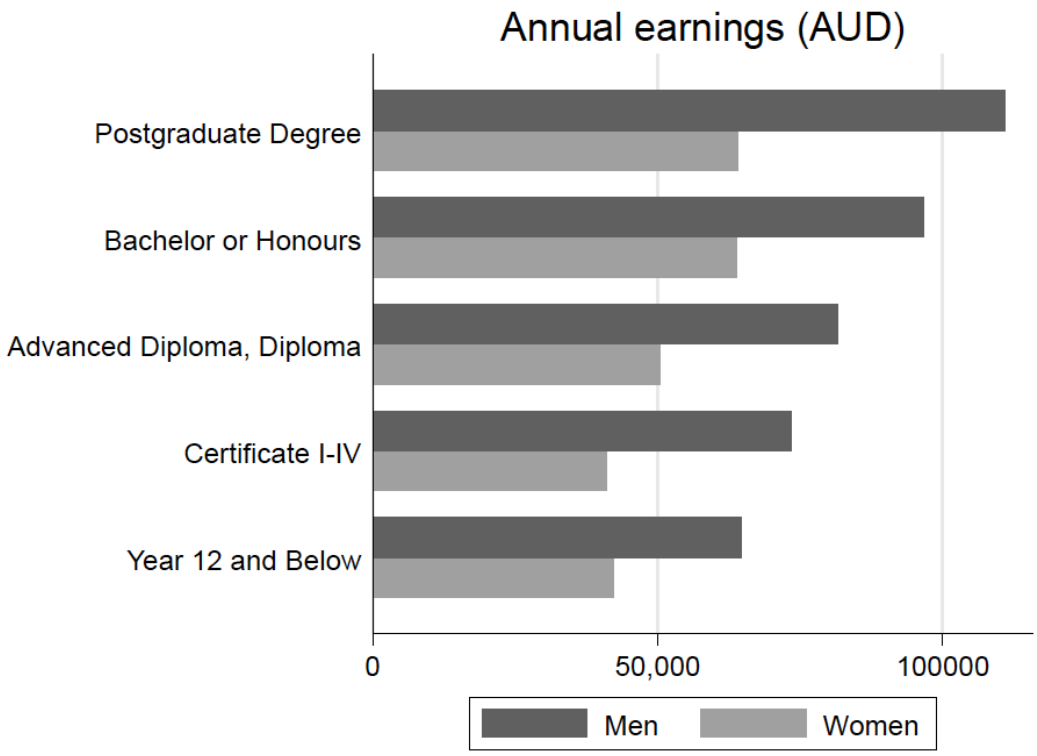
Figure 3 reveals how these differences translate into annual earnings differences. We find that average male workers with a postgraduate degree earn $110,923 in 2012. Average earnings of female workers with the same degree are $64,114, largely because female workers are more likely to be part-time employed.

Average annual earnings of male workers seem to increase by about $10,000-15,000 for each level of education considered in our analysis: Average male workers with Year 12 and below earn about $64,672, those with a Certificate I-IV earn about $73,405, average earnings of Advanced Diploma/Diploma holders are about $81,664, and male workers with a Bachelor or Honours degree earn on average about $96,634.

In contrast, we do not find a linear increase in average annual earnings of female workers across the educational distribution. Female workers with Year 12 and below earn on average $42,296, slightly more than average female workers with a Certificate I-IV who earn about $40,939. Average earnings of

female workers with Advanced Diploma/Diploma are $50,427 and those with a Bachelor or Honours degree earn about $63,948 – slightly more than average female workers with a postgraduate degree.

Figure 3: Annual Earnings by Gender and Education, 2012



Note: Weighted numbers based on weights provided by HILDA.

Taken together, the results presented in Figures 1-3 highlight considerable earnings differentials both between male and female workers and across the educational distributions of male and female workers. Average annual earnings of women are strongly affected by labour supply. Although highly educated women earn higher hourly wages than less educated women, they do not necessarily have higher annual earnings because less educated women may work relatively long hours. In our empirical analysis, we will focus on hourly wages to take into account that labour supply patterns differ considerably between men and women.

4. Methodology

4.1 Cross-sectional analysis

The starting point of our empirical analysis is the conventional human capital earnings function (Mincer, 1974), which relates individual earnings to education and labour market experience. The approach has served as the 'workhorse' of numerous cross-sectional studies over the last four decades.

We use a linear regression model to estimate the rate of return to education. Our baseline model includes the logarithm of hourly wages as a dependent variable. Explanatory variables include the number of years of education, the number of years of labour market experience, and the number of years of labour market experience squared. We estimate separate regression models for male and female workers.

Instead of a cross-sectional model based on a single year, we estimate a pooled model regression model for the time period 2001-2012 to increase the size of our analysis sample. Our pooled regression models include year indicators that capture time effects. We further adjust the standard errors of the model to take into account that we observe the same individuals repeatedly in our pooled sample.

We also estimate a modified version of the human capital earnings function, which takes into account that the returns to education are different across the educational distribution. Specifically, instead of using the number of years of education as an explanatory variable, we employ indicator variables for four categories: (i) Postgraduate Degree, (ii) Bachelor or Honours, (iii) Advanced Diploma/Diploma, and (iv) Certificate I-IV. The omitted reference category contains individuals with Year 12 and below, i.e. we compare individuals in each of the four categories of higher education to individuals with Year 12 and below.

The two linear regression models described above do not take into account that unobserved characteristics (such as ability) may be correlated with educational attainment, which could bias our returns to education estimates. We ignore the potential bias caused by unobserved characteristics because

the empirical literature on the returns to education shows that the bias is relatively small (see Leigh and Ryan, 2008) and because our analysis focuses on understanding the difference between cross-sectional and longitudinal earnings models. It appears unlikely that the bias caused by unobserved characteristics is very different between these models.

4.2 Longitudinal analysis

We compare the results obtained from the cross-sectional models described above to those of a longitudinal model that considers age and time effects (and the interaction between age and time) and that takes into account that individuals may change their position in the wage distribution over time. To illustrate the importance of accounting for dynamic aspects when predicting future wages, we consider mobility rates across the wage distribution.

Table 2 contains the mobility rates across wage quintiles (which split the wage distribution into five equal parts) between two consecutive years. Because the HILDA data cover the time period 2001-2012, two consecutive years may be observed 11 times. We therefore report the average mobility rates for the time period 2001-2012. Table 2 reports the proportion of individuals within each quintile in a particular year that either remain in the same quintile or move to other quintiles in the following year.

Table 2: Average Mobility Rates across Wage Quintiles between Two Consecutive Waves, 2001-2012

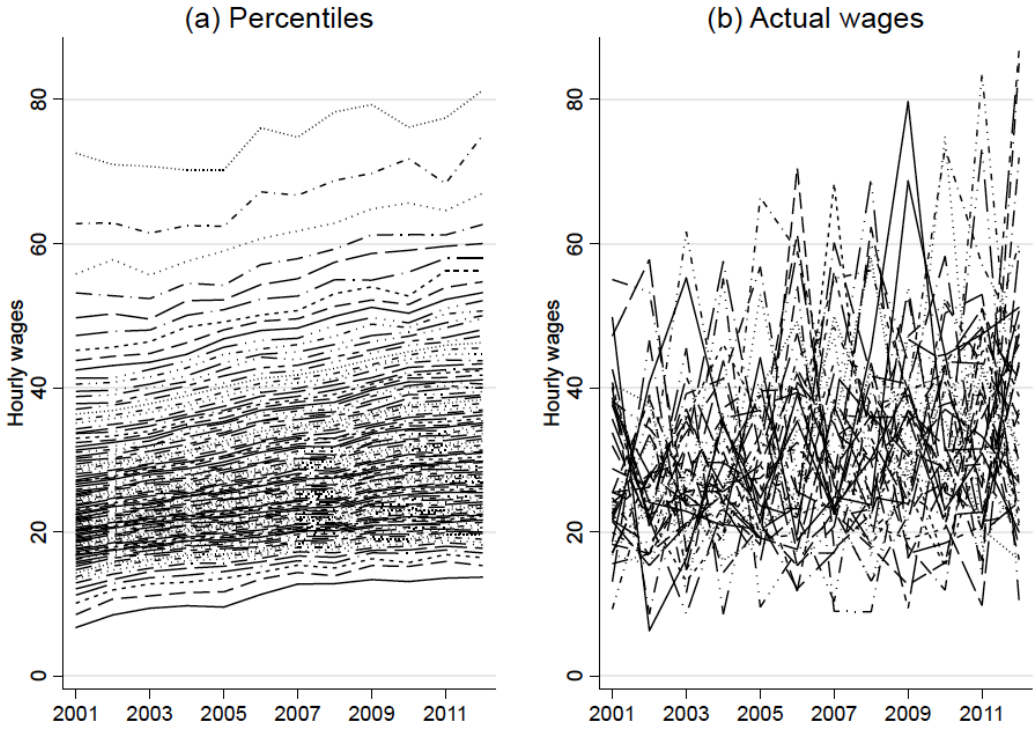
	Wave *t* to wave *t+1*				
Quintile	1st	2nd	3rd	4th	5th
Men					
1st	66.76	21.63	7.26	2.99	1.36
2nd	23.81	47.32	20.34	5.80	2.72
3rd	7.68	21.95	44.50	20.69	5.17
4th	2.91	6.14	23.03	49.04	18.88
5th	1.36	2.09	4.79	19.45	72.31
Women					
1st	56.71	26.73	9.98	3.68	2.91
2nd	27.65	42.48	20.90	6.42	2.55
3rd	9.63	21.66	42.63	19.26	6.82
4th	4.23	6.27	19.96	46.66	22.88
5th	3.18	3.56	6.61	22.20	64.45

Note: Sample based on balanced panel.

The numbers in Table 2 indicate that the earnings of employed men are quite persistent but somewhat less persistent among women. We find mobility rates of up to 24 per cent for men and up to 28 per cent for women between two neighbouring quintiles. In some cases, mobility rates of women beyond neighbouring quintiles reach almost 10 per cent. The numbers in Table 2 highlight the importance of considering earnings dynamics when modelling future earnings. In our longitudinal analysis, we account for temporary and permanent variation in individual earnings over time.

Cross-sectional earnings models assume that all variation in earnings observed between individuals at a certain point in time persists in the future. To provide an intuition for the use of a cross-sectional earnings model, we calculate the percentiles of the wage distribution in each year. The percentiles over the period 2001-2012 are presented in Figure 4(a), which provides evidence for a considerable spread in the distribution of real wages that remains relatively constant over time.

Figure 4: Percentiles and Actual Wages



Note: Sample based on balanced panel.

To illustrate the implications and shortcomings of a cross-sectional earnings model, we compare the percentiles presented in Figure 4(a) to actual wages of a random sample of individuals drawn from our analysis sample. The actual wages of the random sample depicted in Figure 4(b) may be viewed as representative of the development of actual wages over time. Figure 4(b) reveals that average real wages have remained quite stable over the sample period despite relatively high wage mobility.

The comparison of static percentiles to actual wages reveals that cross-sectional models ignore considerable variation in earnings, which may have important implications for the prediction of future earnings. We use longitudinal data to address the shortcomings of cross-sectional earnings models. Empirical studies suggest that observed characteristics explain a relatively small proportion of earnings variability (see Higgins and Sinning, 2013). Unobserved differences can result from temporary variation (due to illness, higher duties, bonuses, overtime, etc.) or permanent variation (such as ability, talent, or motivation).

Additionally, permanent unobserved shocks may be the result of job mobility and promotions or demotions (Meghir and Pistaferri, 2004) and other incidents not accommodated by observed transitions in labour force or life states. Temporary and permanent differences and shocks constitute unobserved variation in earnings between individuals and over time for the same individuals.

Variance component models may be used to capture temporary and permanent variation in earnings. Based on the seminal work of Lillard and Willis (1978) and MaCurdy (1982), econometricians have applied variance component models to the context of earnings dynamics over the last three decades. In our analysis, we estimate a regression model that allows us to consider age and time effects. To predict future wages, we decompose the residuals of a wage regression into a permanent and a transitory component.[6]

[6] A more detailed description of the dynamic earnings model employed in the empirical analysis is given in Appendix I.

The estimates obtained from the dynamic wage model allow us to simulate the unobserved components of the wage equation and to predict future wages of male and female workers by level of education. We take the following steps to use longitudinal data to derive private returns to education:[7]

- We analyse the wage structure over the time period 2001-2012. The resulting information is used to predict the temporary and permanent variation in wages.
- We use actual wages observed in 2001 as a starting point to predict wages over the time period 2002-2040.
- Using age, time trend, and an interaction term between age and time, we run a regression on (the logarithm of) wages. The results from this model are used to predict age-wage profiles, which take into account temporary and permanent variation in wages, over a 40-year time period.
- The age-wage profiles are used to calculate the present value of wage differentials (measured in per cent) between workers with comparable levels of labour supply but different levels of education.
- We compare the wage differentials obtained from the dynamic model to those of a cross-sectional model including indicator variables for different levels of education.

The following section presents the results of the cross-sectional and the longitudinal analysis described above.

[7] It is important to note that the calculation of average private returns to education does not necessarily require the consideration of temporary and permanent variation in wages because dynamic panel data models typically assume that the model error terms are normally distributed with mean zero. We only employ the dynamic model to illustrate the prediction of future wages. However, dynamic panel data models may be used to study differences in the earnings variability across different levels of education and to calculate private returns to education at different points of the wage distribution. Addressing these issues is beyond the scope of this study.

5. Results

5.1 Cross-sectional analysis

The estimates of the human capital earnings function for the sample of male workers are presented in Table 3. The estimates are based on the linear regression of a pooled sample covering the time period 2001-2012. The numbers presented in Table 3 may be interpreted as coefficients that capture the average relationship between the explanatory variables (the number of years of education, the number of years of labour market experience, and labour market experience squared) and the respective earnings measure (hourly wages, weekly earnings, annual earnings).[8]

The standard errors (presented in parentheses) allow us to determine the significance levels of the estimated coefficients. For simplicity, we present stars for different p-values, which indicate significance levels of 5 per cent, 1 per cent, and 0.1 per cent, respectively. The estimates in Table 3 reveal that the estimated returns to education are statistically different from zero at a 0.1 per cent significance level, indicating that we can be very confident about the economic relevance of the positive relationship between education and earnings.

The coefficient measuring the relationship between the number of years of education and hourly wages indicate that an increase in education by one year (given all other factors remain the same) led to an average increase in hourly wages by 7.7 per cent. We also observe a rate of return to education of 8.0 per cent when we use weekly earnings as a dependent variable in our model. Average annual earnings increase by 9.3 per cent if education increases by one year (and all other factors remain the same).

The coefficients on the number of years of labour market experience and labour market experience squared show that the increase in earnings resulting from an increase in labour market experience is significant but that

[8] Using single years to estimate the regression model instead of a pooled model over the entire sample period did not change our results qualitatively, suggesting that the functional relationships captured by the cross-sectional models were quite stable over time.

earnings increase with labour market experience at a declining rate. The constant term is relevant for the construction of the regression model but its interpretation is not very useful because it captures average earnings of individuals without education and labour market experience. The R-Squared measure indicates that the cross-sectional regression model explains between 10.0 and 14.3 per cent of the variation in our earnings variables.

The estimates presented in Table 3 are comparable to other cross-sectional studies that present estimates of the human capital earnings function for other countries and/or time periods.

Table 3: Returns to Education of Male Workers: OLS Estimates, 2001-2012

	Hourly wages	Weekly earnings	Annual earnings
Years of Education	0.077***	0.080***	0.093***
	(0.003)	(0.005)	(0.005)
Experience (Years)	0.018***	0.037***	0.046***
	(0.002)	(0.003)	(0.003)
Experience Squared/100	-0.026***	-0.067***	-0.081***
	(0.004)	(0.006)	(0.007)
Constant	2.055***	5.591***	9.216***
	(0.049)	(0.069)	(0.079)
R-Squared	0.143	0.115	0.1
Number of observations	28552	28581	29248

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account.
* p<0.05, ** p<0.01, *** p<0.001

Table 4 contains the estimates of the human capital earnings function for the sample of women. We find that an increase in education by one year (all else equal) increases hourly wages by 7.0 per cent. The corresponding relationship between education and weekly or annual earnings is 10.7 and 11.2 per cent, respectively. Empirical studies often find that the rate of return to education of female workers is higher than that of male workers. The smaller coefficient of education in the hourly wage regression stems from gender differences in full- and part-time employment.

Table 4: Returns to Education of Female Workers: OLS Estimates, 2001-2012

	Hourly wages	Weekly earnings	Annual earnings
Years of Education	0.070***	0.107***	0.112***
	(0.002)	(0.004)	(0.005)
Experience (Years)	0.015***	0.023***	0.033***
	(0.002)	(0.003)	(0.004)
Experience Squared/100	-0.025***	-0.030***	-0.043***
	(0.004)	(0.008)	(0.009)
Constant	2.099***	4.894***	8.583***
	(0.032)	(0.068)	(0.082)
R-Squared	0.178	0.138	0.113
Number of observations	27750	27777	27842

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account.
* p<0.05, ** p<0.01, *** p<0.001

The estimates in Table 5 translate the returns to education into earnings differentials between groups with different levels of education. The coefficients on educational attainment presented in Table 5 compare average earnings of male workers with certain levels of tertiary education to male workers with Year 12 and below.

Given the same level of labour market experience, we find that hourly wages of male workers with a postgraduate degree are 39.9 per cent higher than those of male workers with Year 12 and below. The hourly wage gap between male workers with a Bachelor or Honours degree and male workers with Year 12 and below is 33.7 per cent. An Advanced Diploma/Diploma increases average hourly wages of male workers by 18.9 per cent if we compare them to those of male workers with Year 12 and below. Male workers with a certificate earn on average 7.6 per cent more than male workers with Year 12 and below.

We obtain similar earnings differentials when we use weekly or annual earnings instead of hourly wages as a dependent variable. The returns to labour market experience are slightly higher when we study weekly or annual earnings. Overall, the modified version of the human capital earnings function presented in Table 5 reveals that the returns to education are not necessarily constant across the educational distribution.

Table 5: Returns to Education of Male Workers by Level of Education: OLS Estimates, 2001-2012

	Hourly wages	Weekly earnings	Annual earnings
Postgraduate Degree (Masters or Doctorate)	0.399***	0.430***	0.479***
	(0.027)	(0.035)	(0.039)
Bachelor or Honours	0.337***	0.355***	0.407***
	(0.020)	(0.025)	(0.028)
Advanced Diploma, Diploma	0.189***	0.212***	0.206***
	(0.022)	(0.027)	(0.036)
Certificate I-IV	0.076***	0.129***	0.154***
	(0.014)	(0.019)	(0.021)
Experience (Years)	0.018***	0.036***	0.045***
	(0.002)	(0.003)	(0.003)
Experience Squared/100	-0.028***	-0.068***	-0.081***
	(0.004)	(0.006)	(0.007)
Constant	2.881***	6.445***	10.212***
	(0.023)	(0.035)	(0.041)
R-Squared	0.136	0.11	0.092
Number of observations	28552	28581	29248

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account. Reference category: Year 12 and below.
* p<0.05, ** p<0.01, *** p<0.001

The picture changes somewhat when we consider earnings differentials between different levels of education within the group of female workers (Table 6). We find that hourly wages of female workers with a postgraduate degree are 37.5 per cent higher than those of female workers with Year 12 and below. The corresponding differences in weekly and annual earnings are 52.5 per cent and 52.3 per cent, respectively.

We also observe that hourly wages of female workers with a Bachelor or Honours degree are 32.1 per cent higher than those of female workers with Year 12 and below. Interestingly, the weekly and annual earnings differentials between female workers with a Bachelor or Honours degree and female workers with Year 12 and below are about 50 per cent and not statistically different from the earnings differentials observed for female workers with a postgraduate degree. This result suggests that female workers with a postgraduate degree work less and therefore do not translate their hourly

wage premium into higher weekly or annual earnings than female workers with a Bachelor or Honours degree.

Table 6: Returns to Education of Female Workers by Level of Education: OLS Estimates, 2001-2012

	Hourly wages	Weekly earnings	Annual earnings
Postgraduate Degree (Masters or Doctorate)	0.375***	0.525***	0.523***
	(0.017)	(0.032)	(0.036)
Bachelor or Honours	0.321***	0.502***	0.531***
	(0.013)	(0.025)	(0.029)
Advanced Diploma, Diploma	0.142***	0.248***	0.271***
	(0.017)	(0.031)	(0.034)
Certificate I-IV	-0.002	0.057*	0.056*
	(0.013)	(0.024)	(0.028)
Experience (Years)	0.016***	0.024***	0.035***
	(0.002)	(0.003)	(0.004)
Experience Squared/100	-0.028***	-0.035***	-0.049***
	(0.004)	(0.008)	(0.009)
Constant	2.845***	6.027***	9.765***
	(0.018)	(0.037)	(0.046)
R-Squared	0.185	0.134	0.109
Number of observations	27750	27777	27842

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account. Reference category: Year 12 and below.
* p<0.05, ** p<0.01, *** p<0.001

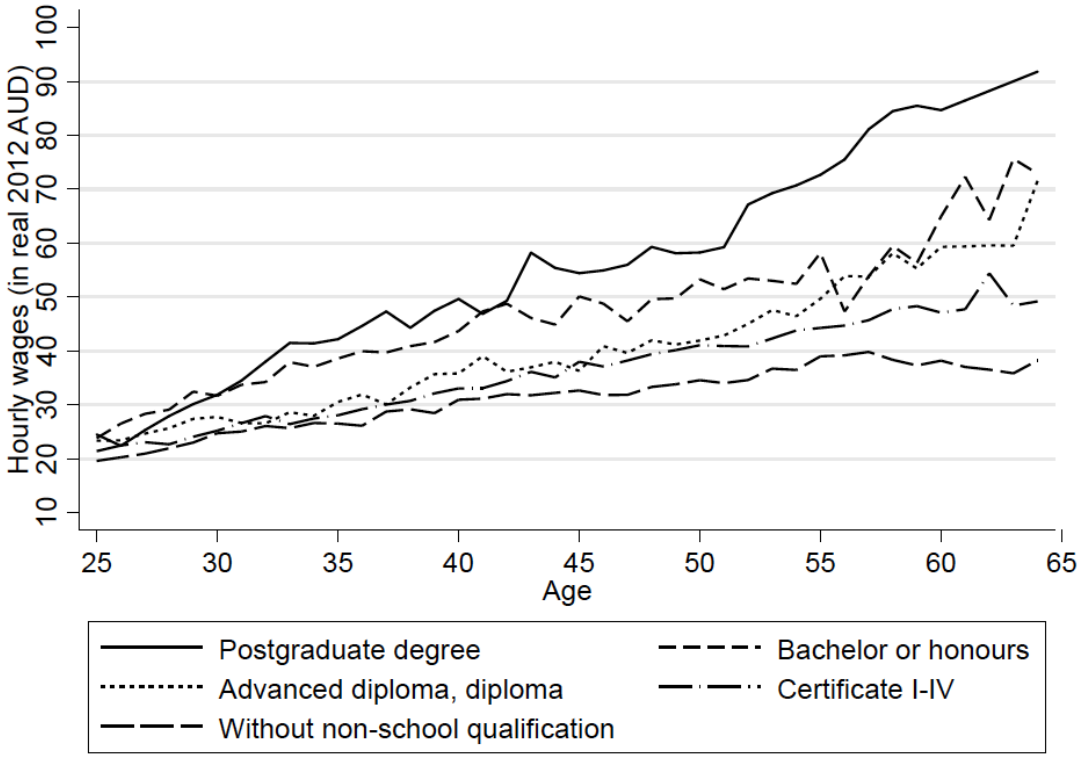
We find that hourly wages of female workers with an Advanced Diploma/Diploma are 14.2 per cent higher than those of female workers with Year 12 and below. The weekly and annual earnings differentials between these two groups are about 25-27 per cent. Differences in hourly wages between female workers with a certificate and female workers with Year 12 and below are not significantly different from zero and the weekly and annual earnings differentials are below 6 per cent (and only significant at a 10 per cent level). These results suggest that the returns to vocational training of female workers are very low. The difference between the hourly wage regression and the earnings regressions presented in Table 6 may be attributed to the large share of part-time employed women.

5.2 Longitudinal analysis

Figure 5 presents the age-wage profiles of male workers based on longitudinal model. We observe that the age-wage profiles of male workers are generally increasing at a relatively constant rate. Wages of male workers with a postgraduate degree grow much faster than those of male workers with a Bachelor or Honours degree after the age of 40.

Wages of male workers with an Advanced Diploma/Diploma are typically about equal or higher than those of certificate holders. The age-wage profile of male workers with Year 12 and below is consistently below the remaining profiles, indicating that the returns to education in relation to this reference group are always positive.

Figure 5: Age-Wage Profiles of Male Workers

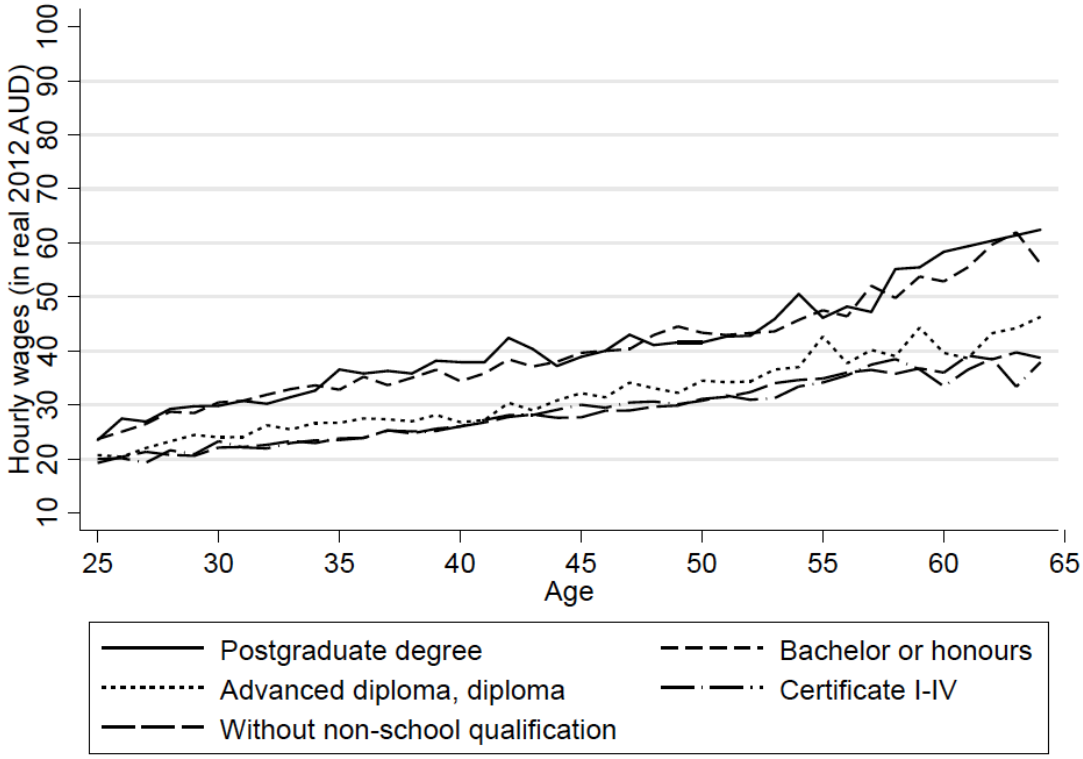


Note: Sample: unbalanced panel. Weighted numbers based on weights provided by HILDA.

Figure 6 depicts the age-wage profiles of female workers, which are much lower than those of male workers. We observe linear increases in average wages over the life cycle. The profiles reveal that average earnings of female workers with a postgraduate degree do not differ substantially from those of

female workers with a Bachelor or Honours degree. We also observe that differences between the remaining groups (Advanced Diploma/Diploma, Certificate I-IV and with Year 12 and below) are rather small, suggesting that the returns to vocational education of female workers are low.

Figure 6: Age-Wage Profiles of Female Workers



Note: Sample: unbalanced panel. Weighted numbers based on weights provided by HILDA.

We use the age-wage profiles presented in Figures 5 and 6 to calculate the returns to education of male and female workers based on the present value of lifetime earnings. The age-wage profiles of workers with Year 12 and below are used as a reference group to obtain results that are comparable to the estimated earnings differentials reported in Tables 5 and 6.

Panel A of Table 7 summarises the cross-sectional returns to education of male and female workers presented in Tables 5 and 6. We compare these results to the dynamic returns to education (Panel B) that were derived from calculating the present value of lifetime earnings using the age-wage profiles presented in Figures 5 and 6. Panel C takes into account that individuals with

different levels of education exhibit different employment probabilities and adjusts the numbers of the dynamic returns to education accordingly.[9]

Table 7: Returns to Education of Men and Women (in per cent), Cross-sectional vs. Dynamic Model

	Men	Women
A. Cross-sectional (static) model		
Postgraduate Degree (Masters or Doctorate)	39.9	37.5
Bachelor or Honours	33.7	32.1
Advanced Diploma, Diploma	18.9	14.2
Certificate I-IV	7.6	-0.2
B. Longitudinal (dynamic) model		
Postgraduate Degree (Masters or Doctorate)	69.9	40.8
Bachelor or Honours	45.9	38.6
Advanced Diploma, Diploma	24.8	10.4
Certificate I-IV	13.8	-0.1
C. Dynamic model, employment-adjusted		
Postgraduate Degree (Masters or Doctorate)	75.9	44.1
Bachelor or Honours	49.9	40.9
Advanced Diploma, Diploma	27.2	11.7
Certificate I-IV	16.0	-0.7

Note: Sample based on unbalanced panel. Weighted numbers based on weights provided by HILDA.

The numbers in Table 7 indicate that the returns to education derived from the longitudinal analysis are quite different from those of the cross-sectional analysis. We find that lifetime earnings of men with a postgraduate degree (Masters or Doctorate) are about 75 per cent higher than those of men with Year 12 and below (Panel C). Women with a postgraduate degree earn about 45 per cent more over their lifetime than women with Year 12 and below. The returns to education of both men and women with a Bachelor or Honours degree are about 40 per cent, suggesting that women with a Bachelor or Honours degree earn almost as much as women with a postgraduate degree. We also observe that women have no benefits from investing in vocational training. Overall, the empirical findings reveal considerable differences between cross-sectional and longitudinal models and between male and female workers.

[9] Specifically, we use a binary Logit model in combination with an extended sample that includes both employed and unemployed individuals to estimate employment probabilities by gender, age, and level of education. We then use the predicted employment probabilities to re-weight the average wage levels presented in Figures 5 and 6.

Finally, because future earnings are very uncertain and closely related to economic growth, we examine the impact of alternative growth scenarios on the estimated returns to education of our preferred model (Panel C of Table 7). Table 8 presents the estimates resulting from alternative growth models based on extremely optimistic and extremely pessimistic growth scenarios (additional annual growth of +2/-2 percentage points). The numbers in Table 8 indicate that the estimated returns to education are remarkably robust with regard to extreme growth scenarios.

Table 8: Returns to Education of Men and Women (in per cent), Alternative Economic Growth Scenarios – Dynamic Model, Employment-adjusted

	Men	Women
Better than usual		
(2 percentage points additional growth)		
Postgraduate Degree (Masters or Doctorate)	83.1	44.6
Bachelor or Honours	52.1	41.5
Advanced Diploma, Diploma	30.3	11.6
Certificate I-IV	17.6	-0.9
Worse than expected		
(-2 percentage points additional growth)		
Postgraduate Degree (Masters or Doctorate)	69.2	43.7
Bachelor or Honours	47.9	40.2
Advanced Diploma, Diploma	24.6	11.7
Certificate I-IV	14.5	-0.5

Note: Sample based on unbalanced panel. Weighted numbers based on weights provided by HILDA.

The numbers presented in Table 8 indicate that the impact of alternative growth scenarios on the estimated returns to education is rather small because we assume that all individuals are equally affected by economic growth. In reality, however, economic growth may have heterogeneous effects on the employment prospects of individuals with different levels of education. While Table 8 serves as a useful robustness check for the purpose of our analysis, a more detailed simulation of the impact of economic growth on the returns to education is beyond the scope of this study.

6. Conclusions

This study uses longitudinal data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey to present new calculations of the private returns to education in Australia. The data allow us to compare the

estimates obtained from a cross-sectional model to those of a dynamic model, which uses longitudinal data to predict earnings over the life cycle and takes into account temporary and permanent variation in individual earnings over time.

We find that lifetime earnings of men with a postgraduate degree (Masters or Doctorate) are about 75 per cent higher than those of men with Year 12 and below. Women with a postgraduate degree earn about 45 per cent more over their lifetime than women with Year 12 and below. Our findings also reveal that women with a Bachelor or Honours degree earn almost as much as women with a postgraduate degree. We further observe that women have no benefits from investing in vocational training. Overall, the empirical findings reveal considerable differences between cross-sectional and longitudinal models and between male and female workers.

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Appendix I – Technical description of methodology

Human capital earnings function

The human capital earnings function can be written as

$$\log(y_i) = \beta_0 + \beta_1 educ_i + \beta_2 exp_i + \beta_3 exp_i^2 + X_i\beta_4 + u_i, \qquad (1)$$

where y_i is one of the earnings measures (hourly wages, weekly earnings, annual earnings) used in our analysis, which refers to ith individual in a sample consisting of N observations ($i = 1, \dots, N$). $educ_i$ denotes the number of years of education of individual i, exp_i is the number of years of labour market experience, and X_i is a set of additional control variables. In our analysis, we use a pooled sample over the time period 2001-2012 to estimate equation (1) and therefore X_i includes indicator variables for each year, which capture year-specific effects, such as inflation. u_i is the model error term and $\beta_0, \beta_1, \dots, \beta_4$ are the model parameters that have to be estimated. We are particularly interested in the parameter β_4, which measures the average effect of an additional year of education on earnings, given that all other factors remain unchanged. Our estimates of the human capital earnings function are presented in Tables 3 and 4. Robustness checks based on a slightly larger sample are presented in Tables A2 and A3 of Appendix II.

To account for nonlinearities in the effect of education on earnings, we also estimate the following extended version of the human capital earnings function:

$$\log(y_i) = \gamma_0 + \gamma_1 postgrad_i + \gamma_2 bachelor_i + \gamma_3 diploma_i + \gamma_4 certificate_i + \gamma_5 exp_i + \gamma_6 exp_i^2 + X_i\gamma_7 + v_i, \qquad (2)$$

where $postgrad_i$ is an indicator variable that takes on the value one if individual i has a postgraduate degree and is equal to zero otherwise. $bachelor_i$ is an indicator variable for individuals with a Bachelor or Honours degree, $diploma_i$ indicates an Advanced Diploma/Diploma, and $certificate_i$ indicates a Certificate I-IV. v_i is the model error term and $\gamma_0, \gamma_1, \dots, \gamma_7$ are the model parameters. The estimated parameters of the indicator variables may

be interpreted relative to the omitted reference category, which consists of individuals with Year 12 and below. For example, the parameter γ_1 measures the earnings differential between individuals with a postgraduate degree and individuals with Year 12 and below.

Net Present Value

Costs and benefits of investments in human capital do not occur at the same time. Therefore, benefits occurring in the future must be converted to a present value basis before a comparison can be made. When an investment decision is made, the investor compares the value of the current investment costs (C) with the present value of the expected returns (PV). The present value of the expected returns can be written as

$$PV = \frac{B_1}{1+r} + \frac{B_2}{(1+r)^2} + \frac{B_3}{(1+r)^3} + \cdots + \frac{B_T}{(1+r)^T}, \qquad (3)$$

where $B_t, t = 1, \ldots, T$ is the benefit in period t and T is the total number of years. r denotes the interest rate. A utility maximising individual will invest in human capital as long as the present value of future benefits exceeds its costs:

$$PV > C.$$

Our longitudinal analysis focuses exclusively on the calculation of the present value of the expected returns. A cost-benefit analysis is beyond the scope of the study.

Dynamic model

We consider a general model that relates earnings, y_{it}, of individual i at time t to age in the following way:[10]

$$y_{it} = p_t(\alpha_i + \beta\, age_{it} + u_{it}) + \lambda_t v_{it,} \qquad (4)$$

$$u_{it} = u_{it-1} + w_{it}, \qquad (5)$$

[10] Our description of the dynamic model is closely related to Doris, A., O'Neill, D., Sweetman, O. (2011): GMM Estimation of the Covariance Structure of Longitudinal Data on Earnings, The Stata Journal 11, 1-21.

where age_{it} is the age of individual i at time t (measured in years). The first term on the right-hand side of equation (4) is a permanent component, which allows for random shocks that have permanent effects. The second term on the right-hand side of equation (4) is a transitory component. p_t and λ_t are loading factors that permit changes in the permanent and the transitory component over time that are equal for all individuals. α_i is the individual-specific permanent component with variance σ_α^2. The error term u_{it} follows a random walk process and the variance of w_{it} is given by σ_w^2. v_{it} are serially uncorrelated transitory shocks with mean zero and variance σ_v^2. Serial correlation in the transitory shocks is modelled using an $ARMA(1,1)$ process of the form

$$v_{it} = \rho\, v_{it-1} + \theta \epsilon_{it-1} + \epsilon_{it}, \qquad (6)$$

where ϵ_{it} is a random variable with variance σ_ϵ^2. The transitory process requires the specification of initial conditions. This issue is addressed by the estimation of the variance of v_{it} at the start of the sample period, σ_{v1}^2, as an additional parameter. The parameters of interest are estimated using the Generalised Method of Moments (GMM) approach, which is computational convenient and does not require any distributional assumptions.[11]

[11] See Doris et al. (2011) for a discussion of the assumptions that are required for the estimation of the model parameters.

Appendix II – Additional tables

Table A1: Returns to Education of Male Workers: OLS Estimates, 2001-2012, Sample Including Top and Bottom 1 Per Cent of the Respective Earnings Distribution

	Hourly wages	Weekly earnings	Annual earnings
Years of Education	0.084***	0.087***	0.098***
	(0.005)	(0.006)	(0.006)
Age (Years)	0.031***	0.072***	0.082***
	(0.005)	(0.006)	(0.007)
Age Squared/100	-0.030***	-0.081***	-0.090***
	(0.006)	(0.008)	(0.009)
Constant	1.475***	4.406***	7.931***
	(0.104)	(0.138)	(0.152)
R-Squared	0.121	0.102	0.088
Number of observations	30679	30709	31388

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account.
* p<0.05, ** p<0.01, *** p<0.001

Table A2: Returns to Education of Female Workers: OLS Estimates, 2001-2012, Sample Including Top and Bottom 1 Per Cent of the Respective Earnings Distribution

	Hourly wages	Weekly earnings	Annual earnings
Years of Education	0.075***	0.106***	0.111***
	(0.003)	(0.005)	(0.006)
Age (Years)	0.018***	0.015*	0.014
	(0.005)	(0.007)	(0.008)
Age Squared/100	-0.018**	-0.016	-0.012
	(0.006)	(0.009)	(0.010)
Constant	1.786***	4.865***	8.655***
	(0.099)	(0.158)	(0.182)
R-Squared	0.122	0.11	0.082
Number of observations	29839	29869	29871

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account.
* p<0.05, ** p<0.01, *** p<0.001

Table A3: Returns to Education of Male Workers by Level of Education: OLS Estimates, 2001-2012, Sample Including Top and Bottom 1 Per Cent of the Respective Earnings Distribution

	Hourly wages	Weekly earnings	Annual earnings
Postgraduate Degree (Masters or Doctorate)	0.419***	0.453***	0.503***
	(0.031)	(0.037)	(0.043)
Bachelor or Honours	0.366***	0.377***	0.422***
	(0.023)	(0.028)	(0.030)
Advanced Diploma, Diploma	0.228***	0.251***	0.249***
	(0.025)	(0.030)	(0.038)
Certificate I-IV	0.098***	0.154***	0.182***
	(0.017)	(0.022)	(0.024)
Age (Years)	0.029***	0.069***	0.078***
	(0.005)	(0.007)	(0.007)
Age Squared/100	-0.029***	-0.079***	-0.088***
	(0.006)	(0.008)	(0.009)
Constant	2.418***	5.390***	9.049***
	(0.096)	(0.128)	(0.144)
R-Squared	0.11	0.093	0.078
Number of observations	30679	30709	31388

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account. Reference category: Year 12 and below.
* p<0.05, ** p<0.01, *** p<0.001

Table A4: Returns to Education of Female Workers by Level of Education: OLS Estimates, 2001-2012, Sample Including Top and Bottom 1 Per Cent of the Respective Earnings Distribution

	Hourly wages	Weekly earnings	Annual earnings
Postgraduate Degree (Masters or Doctorate)	0.387***	0.532***	0.535***
	(0.020)	(0.034)	(0.037)
Bachelor or Honours	0.331***	0.482***	0.500***
	(0.015)	(0.026)	(0.030)
Advanced Diploma, Diploma	0.153***	0.259***	0.290***
	(0.019)	(0.032)	(0.036)
Certificate I-IV	0.001	0.056*	0.052
	(0.017)	(0.026)	(0.030)
Age (Years)	0.018***	0.014*	0.014
	(0.005)	(0.007)	(0.008)
Age Squared/100	-0.018**	-0.017*	-0.014
	(0.006)	(0.008)	(0.010)
Constant	2.609***	6.024***	9.854***
	(0.090)	(0.140)	(0.160)
R-Squared	0.122	0.105	0.077
Number of observations	29839	29869	29871

Note: Sample: Unbalanced panel. Weighted numbers based on weights provided by HILDA. All regressions include year indicators. Robust standard errors, which are reported in parentheses, were adjusted to take repeated observations into account. Reference category: Year 12 and below.
* p<0.05, ** p<0.01, *** p<0.001