

# Higher Education Base Funding Review: The Value of Externalities for Australian Higher Education

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## 1 Introduction and Context

The analysis following examines the value of “externalities”, or “social spillovers”, from Australian higher education. The basic question addressed is: what is the economic value to Australian society which flows from undergraduate university graduates, above and beyond the private benefits accruing to the graduates themselves<sup>1</sup>. The meanings of the term “externalities”, and illustrative examples from higher education services, are provided in Section 2.

Attempts to measure the value of externalities in all areas of economic activity are extremely complex, almost always controversial, and cannot be undertaken without the imposition of simplifying (and sometimes questionable) assumptions. As a result, credible estimates involve boundaries; but even with the use of empirical ranges conclusions reached are invariably contentious and debatable. Unfortunately for this exercise there is no area of economics in which this is truer than that of the estimation of externalities associated with education, and this is arguably particularly the case with respect to higher education. These intricacies, and what they imply for the adoption of an acceptable methodological approach, are an integral part of the exercise and are clarified in Sections 3 and 4.

An understanding of the theoretical and methodological bases of the issue leads to the description and explanation of an estimation strategy of Section 4. Rather than devising a new method, we use an approach accepted by and following from the extensive literature. There are two major benefits with this strategy: one, it incorporates techniques capable of estimating both pecuniary (for example, additional tax revenue from graduates) and non-pecuniary (for example, health improvement) externalities; and two, the data required to make it operational are readily available for Australia.

Section 5 describes the data used in the econometrics aspects of the research, and reports the results. Importantly, this section also offers qualifications to the use of the findings with these caveats, emphasising the many conceptual and measurement issues anticipated in the earlier parts of the report.

The provision of estimates of the value of externalities is very important for higher education public policy, for two reasons:

- (i) Governments are interested in economic well-being and there is no doubt that one of the critical factors contributing to social and economic progress is education; and
- (ii) A basic economic principle is that governments should offer incentives and impose penalties in such a way that socially desirable activities are encouraged

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<sup>1</sup> These typically take the form of expected higher lifetime incomes for graduates relative to non-graduates. See Borland (2002) and Daley and Lewis (2011)

(through subsidies) and that socially undesirable behaviour is discouraged (through higher levels of direct taxation).

These issues have fundamental implications for the prices set by government for public undergraduate higher education, are these are given conceptual context in Section 6. In this section a justification is provided for one of the restrictive assumptions imposed in terms of the estimation externalities, that no differences across discipline or profession are assumed in these values between graduates.

## **2 The Concept of Externalities**

### *2 (i) Introduction*

It is obviously important to be very clear about the meaning of the term “externalities”. The concept is now explained in broad terms, and examples are offered that are of particular importance specific to higher education. An important point related to the complexity of the nature of higher education externalities is that the process is considered to contribute to research and development (R & D), innovation and technical change, which in turn are the major factors contributing to productivity increase, and thus to the society’s economic well-being.

This section also explores issues related to the measurement of the determinants of productivity (and thus per capita GDP), some part of which is conditioned by societal investments in higher education. Significantly, there is no doubt that the nature of the causal relationships inherent in this line of enquiry is one of the most contested areas of empirical economics research; this is examined in what follows. In addition to the difficulties associated with both the both the conceptual bases and the measurement of technical change, there is also a critical time dimension in this area.

Thus we turn some attention to important questions related to dynamic change. One of these is, how long does it take for a more highly educated individual to help deliver the types of externalities from higher education, particularly those from technical change, into measurable outcomes for the society? Second, how much of the technical change that occurs in modern economies can be attributed with some confidence to higher education as such? It should be apparent that clear answers to such questions will likely remain illusory; but they still need to be examined and clarified.

### *2 (ii) Externalities defined*

Externalities occur when one party’s action imposes costs or benefits on another party and the effect is not transmitted through usual market mechanisms. Externalities are of many different types and varieties. Perhaps the most obvious externality in contemporary public policy debate concerns the alleged effects of human activity on global warming, with some of the externalities involving damages to the environment and the flooding of sea level communities.

Externalities can have desirable or undesirable impacts, and some have both<sup>2</sup>. If these effects are beneficial to society they are known as *positive* externalities, and if they are detrimental they are known as *negative* externalities. Table 1 provides general examples of positive and negative externalities.

**Table 1**  
**Types of Externalities**

<b>Externalities</b>	<b>Example</b>
<i>Positive (assumed)</i>	Immunisation of viral diseases Restoration of historic buildings Research and development related to new technologies
<i>Negative (assumed)</i>	Exhaust from automobiles Noise from airplanes Loud music in apartment buildings Pollution

As alluded to in the Introduction, a basic tenet of economic theory is that if no policy action is taken by governments in the presence of externalities, consumption or production decisions made by individuals or firms cannot be best for the society as a whole. This so-called sub-optimality arises from the fact that the decisions taken by private citizens and businesses with respect to the benefits and costs from consumption or production will not take into account the value of the externalities.

It follows that the existence of positive externalities will lead markets to produce a smaller quantity of the goods and services than is socially desirable, while negative externalities will lead markets to produce a larger quantity of the goods and services than is socially desirable. This is part of what is known as “market failure” and implies a legitimate ground for government intervention (Friedman, 1955)<sup>3</sup>.

### *2 (iii) Higher education externalities*

There are very many possible externalities associated with higher education investments, and these can take significantly different forms. A fairly comprehensive list of what is known as non-pecuniary externalities is provided by McMahon (Appendix Table 1), which also provides rough orders of magnitude derived from the literature with respect to the present values of these externalities. These data turn out to be extremely important to the empirical methods we employ and report in Section 5.

Different classification systems can be used to help understand the nature of higher education externalities; one is to define externalities according to whether or not they are “pecuniary” or “non-pecuniary” where the terms suggest the capacity of the externality to deliver financial resources directly to the government. The most obvious form is additional taxation revenue

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<sup>2</sup> For example, alleged global warming is likely to benefit some currently ice-bound areas through increases in the land available for food production.

<sup>3</sup> This conclusion follows only if the consequences of public sector involvement improve the situation from a societal perspective. It is possible that there is also “government failure”, which could mean that misguided or poorly designed policy attempts to reduce the negative impact of market failure make the society worse off.

resulting from the higher productivity of graduates, meaning higher earnings and thus more tax receipts; a related externality takes the form of the additional productivity of non-graduates as a direct of workplace interactions with graduates.

The so-called “non-pecuniary” externalities usually associated with additional levels of higher education that receive the most attention are the societal benefits resulted from the presumed benefits from expansions of higher education for, including: reduced crime; improved health; more informed political debate; and the higher likelihood of attainment of “civil society”. While these factors and others will likely have benefits that do not have a measurable social spillover the McMahon (2006) method allows some dollar estimates to be made of their value (which are explained and used in Sections 4 and 5).

There is an additional and extremely important aspect of higher education externalities related to technical change which is now explained.

#### *2 (iv) The critical role and understanding of technical change*

The contribution of “technical change” to economic growth has been the focus of economic theory and empirical analyses for a long time. The term can mean many things and take many forms, with some of the critical issues concerning the relationship between technical change and higher education being as follows:

- (i) Technical change directly affects productivity growth and there is a literature emphasising the notion that higher levels of education influence positively this process;
- (ii) R & D is considered to be the main contributing factor to innovation and there are clear associations between progress in R & D and expansions of the research conducted in higher education; and
- (iii) Education contributes to the implementation of new technologies, and facilitates the adjustment of the labour force to both positive forces (such as innovation) and adverse shocks (such as unanticipated financial crises).

While there is general conceptual agreement that the processes and factors outlined above are extremely important, a major issue in undertaking an evaluation of externalities is that there is no agreed empirical method which allows the above forces and their complex interactions to be measured. This matters considerably for an interpretation of the methods and results reported below. A point to be highlighted is that, if the focus of the work is on those externalities for which there is an agreed methodological basis, yet essentially ignores the contribution of higher education to technical change, it must be the case that the statistical boundaries reported understate the true (and unmeasurable) value of higher education externalities. This should be seen as an important limitation of all work in this area.

#### *2 (v) The importance of the timing of the delivery of externalities*

It should be clear that the complexities associated with understanding and measuring the interaction of higher education and technical change are profound. There is also a further conceptual and measurement issue in the broad area of higher education externalities related to the timing of deliveries of externalities. This is now considered briefly.

It obviously takes time for a new university student to become a graduate, perhaps as long as five or six years. Once a new graduate is in the workforce there will be a further period before the productivity benefits of higher education can be realized because the processes of on-the-job training are fundamental to returns to investments in human capital, and these are likely to take many different forms and durations.

It follows that estimating the value of externalities, must address the time dimensions involved. To take a current example, a particular level of a tax on carbon emissions can be seen to be extremely good or extremely poor policy depending on how long it takes for the presumed benefits to be realized. That is, putting a value on externalities requires a large number of dynamic modeling inputs, none of which are obvious in empirical terms.

For our exercise some of the parameters involved include: the nature and level of the costs and benefits; the implied counterfactuals involved (what would the government/student be doing with the resources used in the university investment process if the higher education process was not being undertaken?); and the social rate of discount to be applied in the measurement of the relative costs and benefits.

None of these issues can be resolved here. But they are worth describing to encourage humility and caution with the respect to the meaning and clarity of the estimates that emerge of the value of higher education processes.

## 2 (vi) *Summary*

In this section externalities have been defined conceptually, and examples have been provided with respect to the form that these are likely to take with respect to higher education. There is broadly-based agreement concerning the form of many higher education externalities, such as reduced crime and better health, and in other areas such as the role of higher education for technical change. But it is also true that the nature of some of the relationships, their inter-dependencies and the timing aspects of their delivery remain obscure and unresolved, particularly with respect to technical change and innovation. It is critical to recognize that these complexities, if ignored in empirical application, will impart to the results of the measurement of the value of externalities downward biases with respect to the true value of high education externalities.

One area of apparent agreement concerning the measurement of pecuniary externalities concerns the additional tax receipts resulting from the higher productivity of graduates (and incorporating these calculations into private rate of return calculations provide what are usually known as conventional social rates of return). But it is now explained that even in this apparently less contentious area of the economics of education that there are major conceptual issues that have to be addressed.

### 3 Measuring the True Role of Education

#### 3 (i) Introduction

There is a fundamental debate in education economics that is critical to the estimation of the value higher education externalities. In essence this comes down to the relative role played in the labour market concerning two competing hypotheses: human capital theory and screening (or signaling). Some form of resolution between them lies at the heart of the interpretation of one of the main empirical issues of our work, the role of higher education in the generation of pecuniary (fiscal) externalities. These opposing views, and their relevance to the empirical methodology adopted in Section 4, are now explained.

#### 3 (ii) Human capital theory, screening and the value of education

A pure human capital approach in labour economics is that education increases productivity, that this higher productivity leads to higher wages and thus to fiscal externalities generated from tax revenue. Of course, such a calculation needs also to take into account a negative fiscal externality, which is tax revenue foregone during the investment part of the process since at this time individuals enrolled full-time in higher education will not be receiving high incomes and will thus not be contributing much to tax revenues. But taken in its simplest form the human capital perspective implies that all of the net tax benefits associated with private higher education investment should be treated as pecuniary externalities.

However, the story does not end there because of the competing perspective, known as the screening hypothesis. In its simplest form screening theory suggests that instead of increasing productivity, education acts as a signaling device and works as follows.<sup>4</sup> More highly educated people have shown the ability (and motivation) to be successful at education and this identifies them to prospective employees as having greater capacities than the less educated. There are different aspects to screening but arguably they share the common ground of education as a positional good, an issue now addressed.

In his work *Social Limits to Growth*, Hirsch (1976) defines positional goods as those in which their value is determined by how they are rank in comparison to the attainments of others. The essence of the argument relies on several ideas: a characteristic of pure positional goods is that the total level of welfare to be derived from such goods in a market is fixed; and that the value that these goods can provide to an individual diminishes as more people have them. In an extreme version it follows that an increase in the benefits derived from positional goods for one individual is entirely at the expense of others.

This for this aspect of screening in the context of education and labour market outcomes, the value of education depends on the amount and quality of education attained by an individual relative to others. This stands in contradistinction to human capital theory in which it is the *absolute* rather than the *relative* amount of education that matters in the determination of the private returns to educational investments. Because of the presumed relationship between productivity and tax revenue, it must follow that the position taken on this issue is fundamental to the value accorded to fiscal externalities.

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<sup>4</sup> See Spence (1973) and Blaug (1976).

### 3 (iii) *Incorporating human capital and screening aspects of education investment*

It is sensible, and justified by the literature, to consider that the higher income of university graduates consists of returns to both pure human capital and screening. Several empirical studies have consistently confirmed this notion<sup>5</sup>. Consequentially, the value of fiscal externalities will be less than considered to be the case in a pure human capital framework. But *how much less* is a critical empirical aspect of this controversy in the literature and has to be considered to be fundamental to the methods adopted and reported below. Measurement in this area is extremely complicated, with Barr putting this point well: “The validity of the [screening] hypothesis is an empirical issue which is undecided and likely to remain so...”<sup>6</sup>

Barr (1993) argues similarly that the “The ‘tax dividend’ point gives an efficiency case for some subsidy [to higher education], but it is not possible to show how much.”<sup>7</sup> Nevertheless, for public policy purposes in the current exercise a decision has to be made. To assist in this process there is a considerable empirical literature which suggests that the range of human capital contribution to the higher income of a university graduate can be argued to be around 25-40 per cent<sup>8</sup>. In the methods used and now considered we present calculations using both 25 and 40 per cent assumed proportions, but on balance we are inclined towards the lower figure.

### 3 (iv) *Summary*

A very important aspect of the estimation of the fiscal externalities associated with higher education concerns the most fundamental and unresolved debate in the economics of education. This comes down to the basic question: does education increase individuals’ productivity, or does education instead offer to employees a simple device to help identify which prospective employees are likely to be the most productive? One view with is that neither of the extreme perspectives is completely true, and this is a conclusion we endorse.

This then raises the important issue of how much of a graduate’s income can be attributed to the higher levels of productivity implied by human capital theory, since without this assumption the empirical work related to the derivation of fiscal externalities is not credible. From the literature it is reasonable to assume that between 25 and 40 per cent of graduates’ incomes is the result of the additional productivity associated with higher education investments, a conclusion which then allows us to put boundaries around this aspect of the calculation of fiscal externalities.

## 4 **Understanding the Estimation Strategy**

### 4 (i) *Introduction*

To put a value on Australian higher education externalities we have adopted two strategies. The first involves a calculation of the fiscal externalities taking into account the relative weights that need to be accorded to both human capital and screening contributions to graduate relative incomes. Second, to these calculations we need to add estimates of non-pecuniary externalities, and for these we have relied heavily on both the conceptual approach

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<sup>5</sup> See Hungerford and Solon (1987), Brown and Sessions (1999); and Chevalier *et al.*, (2004).

<sup>6</sup> Barr (1993), page 719.

<sup>7</sup> Barr (1993), page 720

<sup>8</sup> See Hungerford and Solon (1987), Bellman and Haywood, (1991), Jaeger and Page (1996), and Bellman and Haywood (2004).

and empirical estimates described and analysed in McMahon (2006)<sup>9</sup>. We employ age-earnings profiles as a tool for estimating both fiscal and non-pecuniary externalities, and we explain how the data presented in Appendix Table 1 can be used in an Australian application.

#### *4 (ii) The use of age-earnings profiles as the basic tool of the analysis*

Economists commonly use human capital theory to estimate so-called social rates of return to education, and this involves comparisons of the average lifetime earnings of graduates and non-graduates. Hypothetical cases can be constructed to calculate the investment returns to the process and there are many examples in the Australian context.<sup>10</sup> With the use of various methodological innovations explained below the tool can also be used to help determine the size of externalities, both fiscal and non-pecuniary; the externalities can be converted into dollar estimates through a conventional discounting process.

To illustrate what we are doing Appendix B shows the sorts of comparisons in conceptual terms between the lifetime earnings of graduates and non-graduates that can be used for our exercise. In this illustration it is assumed that the fiscal externalities from higher education are the point of interest, and that 100 per cent of the additional tax revenues are assumed to be the result only of the additional productivity associated with higher education. Obviously, from Section 3, this is not an assumption that should be used in the actual empirical implementation of our strategy and is offered only to make the method clear.

The data available from McMahon and shown in Appendix Table 1 are a critical aspect of the exercise explained below. This is because they include empirical estimates drawn from a large number of international sources concerning the role of many different types of non-pecuniary externalities from higher education. It is important to understand that these have been presented by McMahon (2006) in a way that allows us to convert them into proportions of conventional rates of return, a point clarified in Section 5.

From Appendix Table 1 it should be clear that all these externalities are extremely difficult to measure in monetary terms. For example, a conversion of a one per cent increase in a human rights index (item 4) into a \$ figure requires knowledge of the independent empirical relationship between a human rights index and the country-specific growth of GDP. Similarly, the education externalities from public health are very hard to identify since they require standardization of a measure of the health status of a country's population. To take this latter example further, a one unit cost of such a health index must then be constructed in order to convert the effect into monetary values. Yet the approach, in combination with the age-income profiles, still provides international approximations that are of use in an estimation of broadly-based calculations of non-pecuniary externalities for Australia.

#### *4 (iii) The method for deriving aggregated higher education externality results*

The first part of our method involves calculating the direct fiscal externality from higher education, and this is fairly straightforward. From econometric estimation illustrated in Section 5 we are able to determine the additional income tax paid by graduates over their lifetimes compared to non-graduates and this will then allow estimation of the extra tax receipts (the 'fiscal dividend') from graduates. These annual figures need then to be adjusted

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<sup>9</sup> These should be considered the most thorough empirical treatment of non-pecuniary education externalities in the international research arena.

<sup>10</sup> See Daly and Lewis (2011).



for the proportion of the additional earnings assumed to be the result of the increased productivity as a result of higher education (remembering from Section 4, this is assumed to be between 25 and 40 per cent).

The second part of the process is more complicated. To help simplify our understanding of the exercise using the McMahon results for Australia, Table 2 provides very broadly-based aggregations of non-pecuniary higher education externalities levels for OECD countries. The conventional social rates of return for higher education are approximated to be 8.5 per cent per year with the value of all the non-pecuniary externalities considered in Appendix Table 1 to be 2.5 per cent per year<sup>11</sup>. These calculations are useful because they provide a convenient way to calculate the total contribution from non-market externalities in terms of domestic age-income profiles, with the latter being readily available for Australia and reported in Section 5.

**Table 2**  
**Higher Education Externalities of OECD Countries**  
**(per cent per annum)**

<b>Social Rates of Return</b>	<b>Returns to Additional Non- Market Externalities</b>
8.5	2.5

Source: Adapted from Table 6.5 in McMahon (2006).

A simple example helps show how this second part is achieved. From Table 2, the social rate of return to higher education in the OECD is approximately 8.5 per cent per year and this can be converted into an expected additional stream of total earnings per year for graduates relative to non-graduates. This means that the value of the non-pecuniary externality - assumed to add 2.5 per cent per year to the social rate of return - will be about 30 per cent above graduate social rates of return (that is,  $2.5/8.5 = 0.29$ ), and this can be converted into a dollar figure for Australian higher education; this then constitutes the value of the non-pecuniary externalities from higher education.

#### *4 (v) Summary*

This section has explained a technique for the use of the Australian age-earnings function as a basis for estimating the value of higher education externalities. Several critical steps are involved using a novel approach to the derivation of fiscal externalities in combination with the McMahon approach.

First, the direct fiscal externalities can be estimated using Australian age-earnings profiles for graduates compared to non-graduates. An important part of the method involves our assumptions related to the extent to which the additional tax receipts represent actual increases in productivity compared to the screening dimensions involved in the process. We are not aware of other work that has used this technique.

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<sup>11</sup> An average estimate derived from McMahon's consideration of a large number of studies.

Second, we have available international calculations of non-pecuniary externalities (relative to private rates of return to higher education). These are given in terms of proportions of the social returns to higher education. These OECD average proportions can be used to adjust graduate earnings in Australia to provide approximations for the dollar values of these externalities in our higher education context.

Section 5 describes the way in which these methods and assumptions have been implemented empirically.

## 5 The Data and Results

### 5 (i) Introduction

What now follows is a description of the data used in the implementation of the conceptual and empirical methods explained above. Two numbers are of interest with respect to higher education: the size of the direct fiscal returns to government from additional productivity; and the value of non-pecuniary externalities associated with higher education. From the explanation of the methods to be used the critical data issues and results depend on estimations of age-earnings profiles.

### 5 (ii) The data and age-earnings profiles

The standard approach employed in labour economics consistent with the construction of an earnings function is an econometric equation which takes the following form:

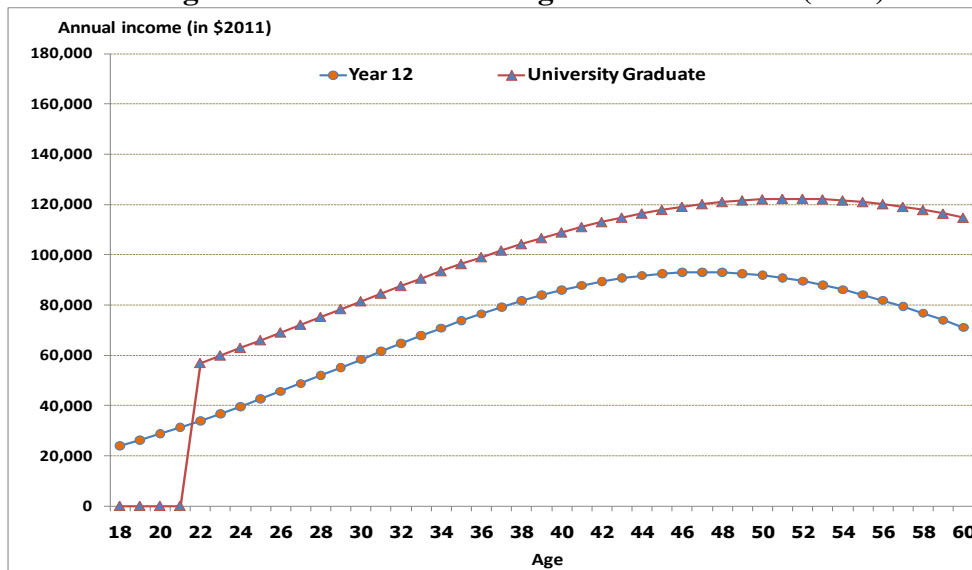
$$\ln I_i = \beta_0 + \beta_1 \text{experience}_i + \beta_2 \text{experience}_i^2 + u_i, \quad (1)$$

where  $I_i$  is annual income of individual  $i$ ; and  $\text{experience}_i$  is the potential length of time a graduate has been employed. Because we are interested in the additional externalities associated with higher education compared to completing high school we also need to estimate the same function for high school completers only.

We use high school completion and university graduate income data from the Household Income and Labour Dynamics of Australia (HILDA) survey for 2008, with the income data been adjusted by aggregate wage inflation 2008-2011 to derive their 2011 values. The data set includes both males and females for all dimensions of labour market status (full-time work, part-time work, unemployed and not-in-the-labour-force). By incorporating sex and labour market status into the earning functions, the estimated age-income profiles should be interpreted as the expected average lifetime earnings for males and females in total. We note that (as is usual) we exclude self-employed graduates since it is difficult to determine precisely what their true incomes are.

Figure 1 presents the results of the econometrics in age-earnings space. In all statistical senses the profiles are very familiar and we are comfortable with the notion that they represent an accurate depiction of Australian contemporary age-earnings relationships differentiated by education.

**Figure 1**  
**Average Australian Graduate Age-Income Profiles (2011)**



*5 (iii) Using the age-earnings profile results to calculate the value of externalities*

Given estimates of the average lifetime earnings differences between graduates and non-graduates we are now in a position to estimate the value of both the direct fiscal and non-pecuniary externalities associated with higher education. The high school and graduate age-income profiles can be used to take into account the additional contribution from graduates in terms of direct fiscal (tax) externalities, since we are able to calculate how much tax each education group will pay for a given level of predicted income in a given year.<sup>12</sup> As discussed in Section 3, a range of direct human capital contributions must be specified, with our chosen boundaries being 25 and 40 per cent, representing the extent to which higher education contributes directly to additional levels of productivity.

With the use of the calculations of the non-market externalities shown in Table 2 the magnitude of these types of education externalities can be derived in a straightforward way, since from Section 4 they are assumed to be a proportion (30 per cent) of the adjusted rates of return from the direct fiscal externalities exercise. We adjust the age-income profile for university graduates accordingly to obtain the non-pecuniary externalities figure. The final step involves adding the two figures.

In addition, because there is necessarily a time dimension in an understanding of these results, a discount rate has to be imposed on the results to make them meaningful in present value terms. We have assumed a real discount rate of 5 per cent per annum.

*5 (iii) The value of externalities from higher education: results*

Table 3 presents the present values of our estimates of the average externalities associated with Australian higher education for both a four year degree and for each year of the degree.

<sup>12</sup> Because the data have been adjusted for 2011 we use the income tax scales for the year 2010-2011 from the Australian Taxation Office.

There are two columns representing the assumptions that the pure human capital effect (PHC) is either 25 or 40 per cent.

**Table 3**  
**Present Values of Higher Education Externalities (Four-Year Degree)**

<b>Assumed PHC:</b>	<b>0.25</b>	<b>0.40</b>
<b>Total Four Year Degree:</b>	\$24,392	\$39,028
<b>Per year of Higher Education:</b>	\$6,098	\$9,757

Note: Calculations assume a 10 per cent downward ability/motivation adjustment.

The essential result is that our best estimate of the addition of the non-pecuniary and direct fiscal dividends to government from higher education in present values lies between about \$6,000 and \$10,000 in 2011 terms for each year of an average university graduate experience.

#### *5 (iv) Summary*

This section has reported the use of the methodology and results following from the adoption of a nuanced approach to the role accorded human capital and screening perspectives, in combination with use of the world's best practice in the area of non-pecuniary externalities estimation. We have used a standard earnings function approach that allows us to incorporate estimates from international research in an application employing the best available cross-section unit record data set in Australia, HILDA. The earnings function econometric results are familiar and thus encouraging, and the estimates of the value of the externalities associated with Australian higher education seem to be plausible.

These conclusions do not of course mean that the estimates can be used without acknowledgement that there are limits to their precision. The considerable attention given in the paper to the major conceptual and methodological issues associated with this exercise, and the lack of adjustments for issues associated with the relationship between technical change and higher education, suggest strongly that the dollar figures offered above are at the very best approximate only.

## **6 The Relevance of the Exercise for the Pricing of Public Sector University Services**

### *6 (i) Introduction*

A contribution for this paper is the provision of boundaries of the values associated with higher education externalities. It needs to be recognized that such an exercise is critical to what might seem to be an unrelated issue, the prices charged by the Australian government for the provision of public sector university education. Yet this is an important aspect of the motivation for the Base Funding review, and the conceptual and measurement issues need to be explored. This can be assisted with a short history of recent pricing levels for higher education services, and is followed by an explanation of the conceptual issues associated with pricing and what these mean for the role of externalities.

### 6 (ii) A brief history of HECS prices

In 1989 the Labor Australian government re-introduced<sup>13</sup> tuition charges, to be paid through an income contingent loan (the Higher Education Contribution Scheme), with the charge being uniform across all disciplines (pro-rated to reflect full-time equivalent years of undergraduate education). It is relevant to note that the so-called “Wran Committee Report”<sup>14</sup> recommended a three tier charging system with the level of the charge reflecting course costs.<sup>15</sup>

The uniform cost (per year of university) policy was changed by the in-coming Coalition government considerably in 1997 through the introduction of three levels of tuition charges, but differently from the Wran Committee’s position, the new charges reflected both course costs but included also a component reflecting expectations of the future earnings of students. While expensive courses to teach, such as medicine and dentistry were charged the highest levels, some of the cheapest courses to teach, such as law, were put in the highest tier and an expensive course to teach, nursing, was put in the bottom tier of prices.<sup>16</sup>

More changes came about in 2005 and beyond, with universities being allowed to increase HECS fees by up to 25 per cent of the post-1997 levels. Further, several of the cheaper courses in terms of teaching costs were moved to the highest tier (business and computing studies, for example. These latter changes were presumably made on the basis of the expected future earnings of individuals studying in these areas.

In 2011 it would be fair to describe the current structure of HECS prices as lacking an internally consistent conceptual basis and this would have informed the Bradley Committee’s recommendation for the current Base Funding Review.

### 6 (iii) Understanding price setting in the context of externalities

The importance of the quite different approaches to undergraduate tuition pricing relates to the point explained earlier, concerning the role of government in terms of prices and implicit subsidies associated with the provision of undergraduate teaching services. The essential issue is that if governments wish to set prices in accordance with economic theory these prices should be determined by the interaction of course costs and the expected value of the externalities of higher education. One further important point needs explanation as background to this issue and the role of the research reported below.

It is that in a world characterized by the application of mainstream economic principles, the price set at the margin for higher education tuition should reflect two things represented by the following simple equation, with all factors expressed in terms of dollar present values:

$$\text{Price} = \text{Costs} - \text{Externalities} \quad (2)$$

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<sup>13</sup> Tuition charges were abolished in 1973 (for background see Chapman, 2006).

<sup>14</sup> Wran Committee (1988).

<sup>15</sup> It is pertinent to this paper that the conceptual position of the Wran Committee’s recommendation sits comfortably with the pricing formula explained below.

<sup>16</sup> For analysis of the financial effects of these changes see Chapman and Salvage (1997).

As a hypothetical example, if the provision of dentistry education costs \$15,000 per year, but the provision of history education costs \$8,000 per year, then the price charged for dentistry is given by:

$$\text{Dentistry charge} = \$15,000 - \text{Externalities} \quad (3)$$

And the price charged for history is given by:

$$\text{History charge} = \$8,000 - \text{Externalities} \quad (4)$$

What this means for price setting in the context of the value of externalities is now addressed.

A very important issue raised by the above explanation of economic approaches to pricing for university services must relate to the assumptions imposed upon the differences in the value of externalities delivered with respect to the course studied. To make this concrete, if it is assumed that the externalities from a student enrolled in dentistry is the same as the externalities from a student enrolled in history, and that in present value terms per year these values are \$5,000 per year, it must then follow that the charge set by the government will be \$10,000 for dentistry [that is, \$15,000 - \$5,000] and the charge set by the government will be \$3,000 for history [that is, \$8,000 - \$5,000].

*6 (iv) Do expected differences in lifetime earnings undermine the assumption of equality between degrees in the delivery of externalities?*

The assumption that the value of externalities from higher education is independent of the course studied is typically adopted in the literature (McMahon, 2006). While this would seem to be reasonable for externalities such as reduced crime, in at least one respect this simplification is more contentious, and relates to the calculations of fiscal externalities related to higher receipts of taxation. A basic point comes down to the recognition that on average people in some professions (for example, medical specialists) will earn more over their lifetimes than those in others (for example, teachers). A reasonable question is, do the differences between the financial returns to different degrees undermine the assumption that the value of externalities?

Some responses to this issue include:

- (i) As much as 30-40 per cent of students enrolling in a course do not graduate and thus are unable to derive the expected lifetime benefits of attaining a degree;
- (ii) Many students undertake courses in subject areas that are unconnected to their eventual profession (or professions), such as is the case for political science and economics;
- (iii) Within particular professions there are extremely large differences in the expected incomes of graduates within the broadly defined group<sup>17</sup>; and

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<sup>17</sup> Some corporate lawyers will earn up to 10 times or even more the incomes of lawyers choosing to make their profession Legal Aid, for example.

- (iv) It is not unusual for graduates to make a number of changes over their lifetimes in the type of work they do and the institutions in which this is done (for example, the Commonwealth public service employs many former lawyers, psychologists and academic economists).

On balance it seems to be reasonable then to use the pricing rules explained above under the assumption that the expected value of higher education externalities do not differ between the courses in the higher education system. This then justifies the assumption imposed in the derivation of the externality values presented above.

#### *6 (v) Summary*

An important motivation for calculations concerning the value of higher education externalities is to assist in the pricing of Australian public university courses. Critical to this exercise must be the adoption of a pricing rule which takes into account both course costs and the value of externalities. This rule has been described and an explanation has been offered with respect to a particularly contentious presumption behind the empirical methods and results, which is that the value of externalities is not related to the course undertaken. Arguments have been offered in support of this approach.

It is of considerable interest to record that since HECS was introduced in 1989 no charging regime has been consistent with the basic economic principles explained above. From 1989 to 1997 the Labor Government adopted uniform charges, an approach which implicitly accords very different presumed values of externalities between degrees. In 1997 the Coalition government significantly changed the structure of charges and in so doing made them a hybrid policy regime incorporating both course costs and presumed expectations of lifetime income differences between professions, and changes of these types were expanded in 2005. It is of course always the case that the politics of public policy design rarely reflect basic economic principles.

## **7 Conclusion**

Our analysis has traversed a highly complicated area of economic analysis, in conceptual, theoretical and measurement terms. Estimating the value of the externalities associated with higher education is arguably the most complicated area in the economics of education literature, yet it is also a critical component for public policy in this area.

We have reported the complexities with as much accuracy as we can, and have endeavoured to be very precise with respect to the limitations of method and the necessary restrictiveness of the assumptions required. It should be stressed, again, that the measurement issues associated with the issue as such as to imply that the range of estimates produced should be interpreted to be lower boundaries of the true (and in reality, unmeasurable) externalities from higher education. With this caveat we have some confidence that the calculations offered are consistent with the sound application of theoretical and methodological economic and statistical principles.

One reason our job has been difficult and our conclusions open to debate is that this exercise has not been done comprehensively for Australia and we have had to impose quite limiting assumptions to come up empirical findings that might apply to the domestic context. As well,

there are many technical and theoretical complications associated with these issues and estimations.

A further complication is that there is no evidence that the value of the externalities differs in a systematic way between courses studied, disciplines and professions, and consequently – like most analysis in this area - we have imposed the assumption that the spillovers will be delivered independently of these factors. This has been approached through calculation of the externalities for the hypothetical average person enrolling in higher education.

There is a critical implication from the assumption/recognition that the value of the externalities does not differ between courses. It is that pricing decisions made on the basis of government contributions being a reflection of the value of externalities must then involve the same level of subsidy for each student. If this is the case it follows that prices should be set in accordance with estimates of the costs of courses.

With these important qualifications and complexities we are prepared to present a very approximate and aggregate range of the expected discounted value of the externalities associated with an additional year of higher education in an Australian context, valued at the time of enrolment. This range, in current dollars, is between \$6,000 and \$10,000.



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**Appendix Table 1**  
**Estimates of Education Externalities**

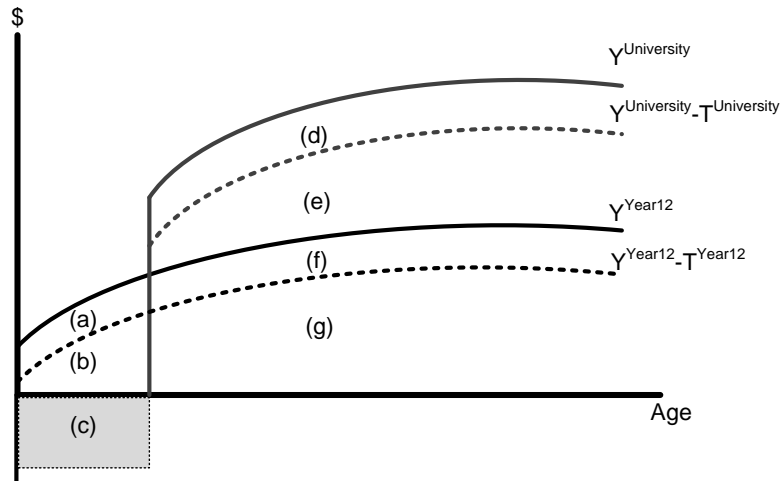
<b>Type of Outcome Affected by Education (1)</b>	<b>Percent Change in Outcome of Education After 40 Years* (2)</b>	<b>Basis for Estimate (3)</b>	<b>Source (4)</b>
<b>1. Better Public Health</b>	Positive, but public vs private health effect unknown	Micro-regressions only. AIDS educ. potential.	Grossman & Kaestner (1997)
<b>2. Lower Pop. Growth</b>	0% in Africa, ↓ elsewhere	↓ fertility but ↑ health	Democratization: Appiah and McMahon (2002: 50-1, 65-7), Data from <u>Freedom House</u> (1999: 536). Volunteering and Financial Giving: NCES (1995 and 1998)
<b>3. Democratization</b>	36% ↑ in Democracy (i.e. Freedom House Index up 2.9 (from 3.7) to 6.6)	Note: This investment of \$13.80 per capita raises gross enrollment rate by about 20 percentage points.	
	Includes 2.3% for more volunteering: .2% of mkt rate Includes more fin. gifts: 12% give over 3% of their income	Volunteering and Financial Giving are at each income level.	
<b>4. Human Rights</b>	4% ↑ in Human Rights, on Freedom House Index		Appiah & McMahon (2002; 51).
<b>5. Political Stability</b>	3.1 % ↑ in Political Stability, Internat' Country Risk Guide		
<b>6. Lower Crime Rates</b>	2% ↓ in Homicide Rate 1.2% ↑ in Property Crime	But <i>secondary</i> enrollment reduces property crime 9% if income controlled for.	Appiah and McMahon (2002: 51-2)
	Plus 2% rate of return due to	Less incarceration costs	Lochner (1999)
<b>7. Deforestation</b>	0.3% ↓ in annual Forest (and wildlife) Destruction Rate	<i>All occur from combined indirect effects of slower population growth, less poverty, more democracy and fast economic growth.</i>	Appiah & McMahon (2002: 41, 52)
<b>8. Water Pollution</b> (For India, better data)	13% ↓ in Water Pollution		McMahon (2002: 216, 234-5)
<b>9. Air Pollution</b>	14% ↑, growth increases it.		
<b>10. Poverty Reduction</b>	18% ↓ in Poverty	Pri. & Jr. Sec in villages	A.&M (2002:51)
<b>11. Inequality Reduced</b>	8% ↓ in Inequality (in GINI)	Only if access widened	A & M (2002: 51)
<b>12. Geographic Spillovers</b>	Positive as HC is gained Negative where HC leaves	Jr. Sec helps provinces Higher Ed. ↑ Emigration	
<b>14. Informal Knowledge Dissemination</b>	Overlaps 1-13 above Unknown net effects	Technologies raise non-market productivity too.	e.g. Moretti (2002)
<b>15. More Schooling</b>	20% ↑ in Enrollment Rates	From 2% ↑ in investment	McMahon(2002:164)

Source: Adapted from Table 6.4 in McMahon (2006).

## Appendix B Illustrating Calculations of Fiscal Externalities Earnings and Taxes

Figure 1 below illustrates several elements pertaining to the calculation of private rates of return as well as the value of fiscal externalities. In the figure,  $Y$  represents gross income and  $T$  represents income tax paid by each level of education.

**Appendix Figure 1**



Where:

- (a) is total opportunity cost of government in terms of foregone tax income;
- (b) is total after-tax income earned in the first four years upon completing Y12;
- (c) is total private costs of pursuing university study;
- (d) is total additional income tax paid by university graduate;
- (e) is total additional after-tax income earned by university graduate;
- (f) is total income tax paid from 4 years after completing Y12 until retirement; and
- (g) is total after-tax income earned from 4 years after completing Y12 until retirement.

With the figure, private benefits and fiscal externalities can be calculated as follows:

- (i) Private benefit =  $(e)-(b)-(c)$ ; and
- (ii) Fiscal externalities =  $(d)-(f)-(a)$ .