Final Report

Cost/Benefit Analysis Relating to the Implementation of a Common School Starting Age and Associated Nomenclature by 1 January 2010

Volume 3

Appendices

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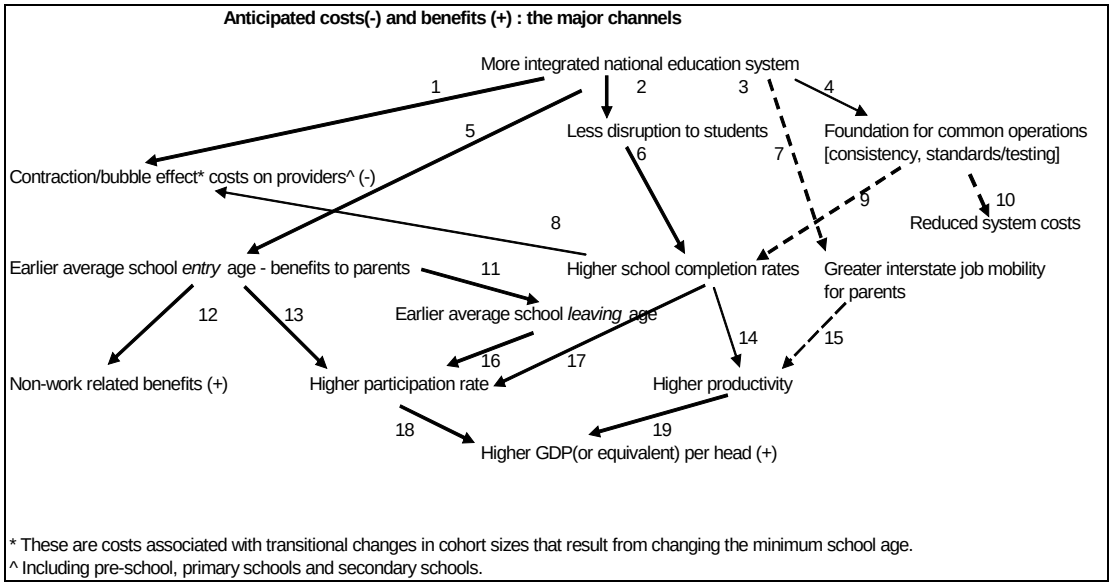
Appendix A: How the policy options were modelled

The first step in the modelling was to construct a dataset which quantitatively describes the education sector as it currently stands. This dataset is discussed in detail in Appendix C. The dataset was then updated to reflect an assessment of what the education sector could look like in 2010, the year the proposed options would take effect. This 2010 baseline dataset is discussed in detail in Appendix B.

The 2010 baseline was then subjected to modelling of the different channels through which the policy options would be likely to have an impact. Conceptually, the major costs (-) and benefits (+) of the options under consideration are described in Figure A.1. The unbroken lines indicate those links where quantitative modelling has been attempted.

Figure A.1 Schema of major channels affecting costs and benefits



The total amount of goods and services produced per person (or 'GDP per head'), usually represented per year, is the standard measure for comparing prosperity between nations and over time. The measure of GDP per head is a strong and practical predictor of a range of indicators of society's well being – and is worth pursuing in its own right. The use of GDP as the economic measure in the model is detailed in Appendix D. That is why the 'bottom line' in terms of assessing the net benefits of each option is the extent to which GDP or its equivalent – for example, the value of increased leisure time per head – is increased.

Because the population growth scenario is the same for each of the options, the assessment of net benefits centres on changes to GDP or its equivalent. Because GDP is a 'flow' concept – for example, Australia's GDP is about $800 billion *per year* – the flows of costs and benefits over time have been converted into a single point estimate, in 2004-05 dollars, by the use of a common discount rate.

Before examining each of these channels in more detail, three common structural drivers of the analysis can be identified.

Cohort impacts

A central driver of the analysis is the estimated cohort impacts in 2010. Current school starting age policies were applied to projected age cohorts in 2010 to estimate the size of cohort impacts

resulting from the adoption of each of the 'pure' options, the 4 years and 5 months option, the 4 years and 6 months option and the 4 years and 8 months option.

A starting point for estimating the cohort impacts is to assume that parents send their children to school at the first opportunity. For example, given this assumption, the 4 years and 6 months option would reduce the cohort of New South Wales 4 year olds by 1/12 (or 8.3 per cent) at the time of the change – because it implies a one month delay for entrants into universal schooling.

The Australian Bureau of Statistics (ABS) projects that, in 2010, there will be 83,152 four year olds in New South Wales. That in turn suggests that the cohort impact in New South Wales could be up to (1/12 x 83,152=) 6929 fewer students.

However, not all children enter universal schooling at the first opportunity. To the extent that entry is deferred then the cohort impact will be reduced.

The national data indicate that in 2002 about 20 per cent of New South Wales children aged '5 and under' entered universal schooling one year later than they were entitled to. An even higher proportion of those who were aged 4 years and who were entitled to school entry were apparently delayed. The 'late starter' effect is by no means unique to New South Wales. Appendix G provides estimates for each jurisdiction.

To account for this phenomenon, the cohort contraction has been scaled according to the proportion of assumed 'prompt starters' in each jurisdiction. The proportion of prompt starters is equal to 100 per cent less the proportion of late starters. For example, the cohort impact in New South Wales given the '4.6 Scenario' has been estimated as (1/12 x 80 per cent) = 6.7 per cent.

'Late starters' reduce the costs (and benefits) associated with each of the options.

At the time of the change there would be immediate and permanent impacts on pre-universal schooling child care. Changes in the cohort would be expected to have opposing impacts depending on the type of child care.

Both outside school hours care and vacation care *complement* school attendance. Demand for these services would be expected to rise or fall in line with the provision of universal schooling.

The demand for other types of pre-universal schooling and child care are modelled as *substitutes* for school attendance - thus the demand for each child care type (by 4 year olds) is assumed to rise (decline) in line with the changed proportion of 4 year olds able to enter universal schooling.

For example, 33.6 per cent of New South Wales 4 year olds are estimated to be in receipt of private long day care. With 6.7 per cent of 4 year olds not accessing universal schooling, the modelling assumes that 33.6 per cent of all New South Wales four year olds will be placed in private long day care. That amounts to an additional (or 33.6 per cent x 6.7 per cent =) 2.2 per cent of New South Wales four year olds in private long day care.

Similar calculations are made for community-based long day care, family day care, pre-school, informal care and parental care. The same modelling assumption is made for the other jurisdictions, except for South Australia.

These impacts are summarised in Table A.1 for the case of New South Wales.

Table A.1 Modelling of the first year impact of the 4.6 scenario for New South Wales

4.6 Scenario (changes from 2010 baseline)								
		2010 - calculation of cohort impact						
				Age in years at June 2010				
		0	**1**	**2**	**3**	**4**	**5**	**6**
Pre-school and child care	Outside school hours					-0.01%		
	Private long day care					0.9%		
	Community based long day care					0.4%		
	Family day care					0.2%		
	Pre-school					0.0%		
	Vacation care					-0.004%		
	Informal care					0.9%		
	Parental care only to age 5					0.4%		
Primary	Total					-2.7%		
	Catholic							
	Independent							
Secondary	Total							
	Catholic							
	Independent							
Post-School	TAFE							
	University							
Employment	Full Time							
	Part Time							
Population	Jun 2010 (ABS projection)	80521	81005	81670	82421	83152	83907	84586

Pre-school enrolments are assumed to be shifted with no change in size. However, in most states and territories where there is an increase in the cohort size brought about by a younger minimum school starting age, there would need to be commensurate pre-school cohort adjustments in 2009 to prepare the children for school in 2010. Thus pre-school changes, in line with anticipated school sector changes in 2010, are modelled as a one-off impact in 2009.

The child care impacts are ongoing, driven not just by the impact on four year olds in 2010, but also by four year olds in 2011 and every year thereafter. The number of 4 (and 5) year olds is expected to remain essentially static at the national level between 2010 and 2051. (The ABS projections assume a decline in absolute numbers of 2.8 per cent over this period.)

The modelling assumes no change in the number of 4 (and 5) year olds over the period so as to make the calculations more tractable. This is an example of how extra finessing of the estimates would likely have a low return in terms of improving the broad conclusions of the cost benefit analysis.

Likewise, the assumed cohort impact (in the example above, the 83,152 x -2.7 per cent = -2,256) is assumed to be constant as it is tracked year-by-year (through each year of primary school then secondary school then VET/University and into employment).

Prices

The cost benefit analysis results are essentially cohort effects multiplied by prices/costs so as to generate estimates of costs and benefits in each year.

For this reason, prices and costs have been calculated on a 'per capita annual basis' so that they will easily mesh with the cohort impacts. Judgement has been applied to some of the prices because it is generally the 'marginal' price or cost that is relevant, not necessarily the average price or cost. Much publicly available data is based on average rather than marginal costs, such as for example, average child care costs, average per capita school funding, average weekly earnings and so on. The estimates for prices and costs used in the cost/benefit analysis are discussed in detail in later sections.

The calculated costs and benefits are discounted back to 2004-05 dollars by a common discount rate – the third structural driver of the results.

Choice of discount rate

> *The recommended benchmark discount rate in the budget-dependent sector is set at 8 per cent real….*[1]

Between 1900 and 2004 Australian equities have had a real return of 7.6 per cent per annum. Therefore, the Department of Finance guideline is broadly consistent with historical real Australian equity returns. The application of an equity rate of return (as distinct from the lower 'risk-free' rate of return – or something in between the two) can be defended.

Looking ahead, however, an '8 per cent real' assumption seems a little high. The modelling therefore uses a discount rate which was built upon Inter-Generational Review (IGR) assumptions for a 3 per cent expected real return (equivalent to GDP growth), a bond premium of around 0.25 per cent and 3.5 per cent on top of that for equities (the 'equity premium').

In the first decade of this century, with (IGR) assumed real economic growth of 3.1 per cent per annum, this assumption results in a real discount rate of (1.031 x 1.035 =) 7.0 per cent per annum, trailing off to 5.8 per cent per annum by 2020 as projected IGR economic growth slows down.

Although alternative credible choices for the discount rate affect the calculated costs and benefits, they do not change the ranking of the proposals.

Modelling of the static macroeconomic impact of a change in the average minimum school entry age

This link is mechanical and quantitatively dominant. The impact of each of the options (other than option 4.8) would marginally lower the average age at which Australian children become eligible for entry to formal education.

In modelling terms, other than for the 4 years and 8 months option, additional children would begin their education one year earlier than otherwise. They would also enter the workforce one year earlier than otherwise.

The cohort following one year behind the introductory cohort is of 'normal' (or pre-policy change) size. It is not smaller than 'normal' size. That is, there is no immediate 'cancelling out' of the impact of the introductory cohort.

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[1] Commonwealth Department of Finance and Administration, "Handbook of Cost-Benefit Analysis", p58

Instead, the increased size of the introductory cohort remains in the schooling sector for the full 13 years the children are at school. Once they leave school and enter the workforce, the workforce remains larger than in the pre-policy change workforce scenario *over the course of the introductory cohort's entire working life and beyond.*

To make the modelling finite, the costs and benefits have been estimated through to 2072-73. If the benefits and costs beyond 2072-73 were to be taken into account they would add about a quarter to the net benefit or net cost of each option.

In effect, for all options other than the 4 years and 8 months option, the period of 'school free' childhood would be shortened and working life would be lengthened. Some may charge that there are psychological costs to children from having a reduced childhood. Then again, earlier schooling may offer the child benefits of a more stimulating environment. Whether this represents a gain in educational terms, or produces better educational outcomes, is contestable and outside the scope of the Project.

The dynamic impacts of reform explained in the next section, although smaller, are arguably of higher importance educationally. They represent, fundamentally, the educational outcomes of national consistency in the area of minimum school starting age. It is to achieve these outcomes that reforms around minimum school starting age and nomenclature are being considered.

Modelling of the dynamic macroeconomic impacts

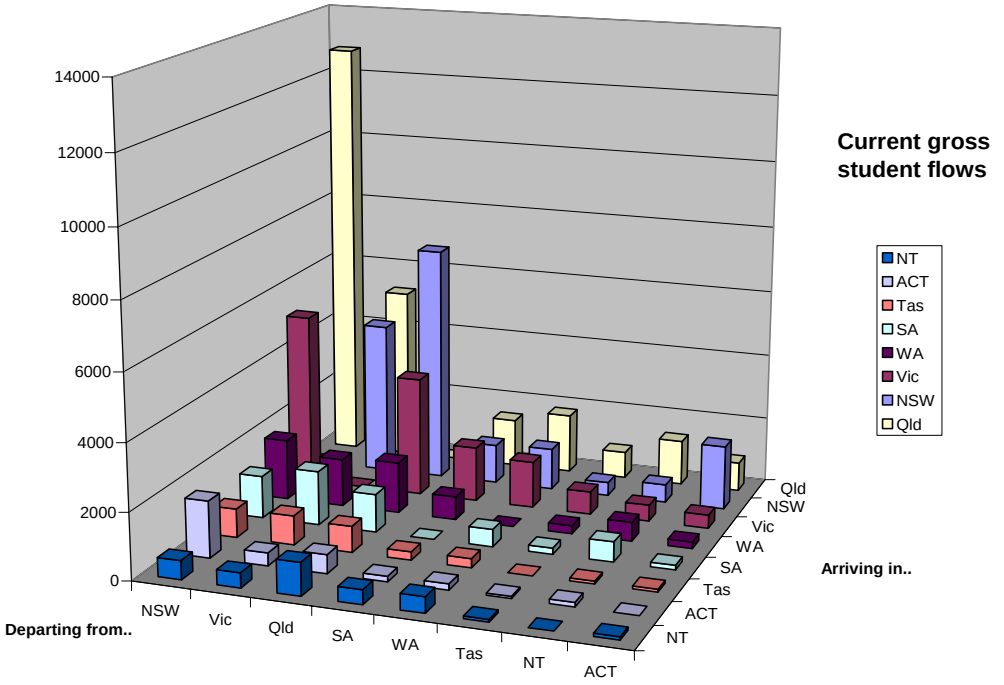
There is a body of economic literature on the links between education, especially in terms of years of formal schooling, and economic prosperity. This is the basis of Appendix E.

If a more consistent and integrated education system in Australia were to raise national secondary school retention rates, then it would be expected that there would be some dynamic growth benefits for the Australian economy. These are termed the dynamic macroeconomic impacts. The introduction of a common minimum school starting age and nomenclature around the early years of schooling is seen potentially to contribute to such national consistency. In that way, it is assumed that it would produce an increase represented by the dynamic macroeconomic impacts of the change.

Two particular 'channels' have been incorporated in the cost benefit analysis to represent the dynamic macroeconomic impacts. One channel represents the 'participation' effect and the other represents the 'productivity' effect from higher secondary school retention rates. The estimates of the macroeconomic impacts are subtle and are explained as follows. Note that each link in the chain of reasoning forms the basis for other links in the argument.

(a) There were 76,327 children (aged 0-14) who moved between States/Territories in 2003-04. This is summarised in Figure A.2 below. Note that 'traffic' is dominated by the eastern States. Figure A.2 below. In the following calculations and bar charts, it is assumed that all children who move interstate face a structural barrier or obstacle. The bar charts simply represent the total number of children who move between states with different minimum starting ages. In reality, some of these children may be affected by differences in school starting age, while others will not, depending on when their birthday falls, the direction in which they move (whether to a school/system with an older or younger starting age) and placement procedures in the receiving state/territory.

Figure A.2: Current gross student flows (2003-04)



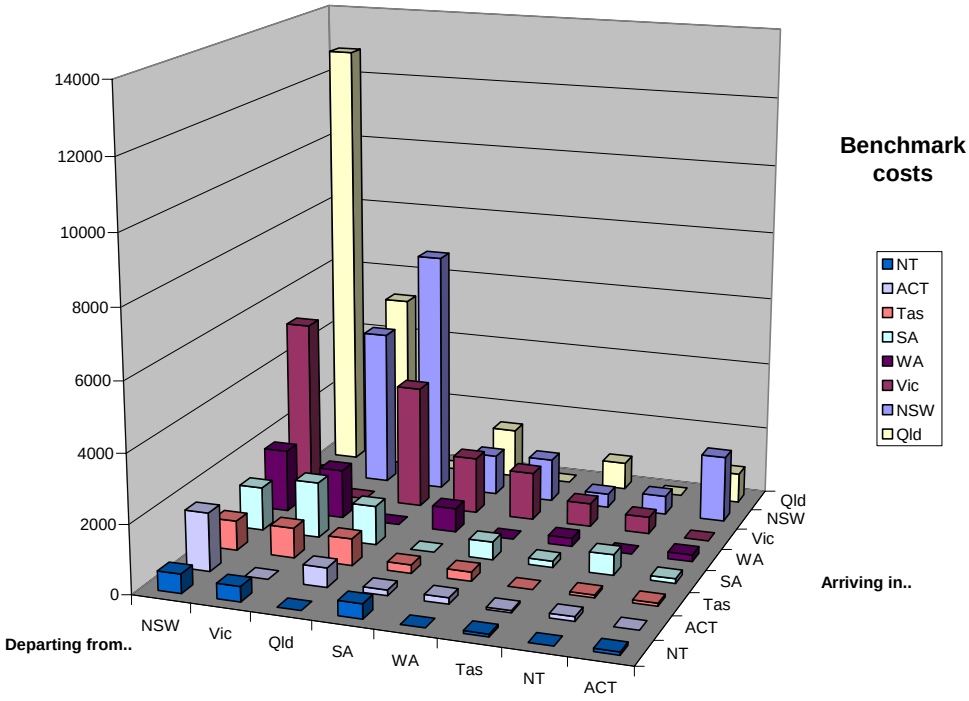
(b) There were an estimated 3,883,596 children (aged 0-14) at June 2003.

(c) The probability that a child (aged 0-14) will move borders in any given year is assumed to be (76,327 / 3,883,596 =) 1.97 per cent.

(d) The probability that a child will move borders over the 11 compulsory years of schooling is assumed to be (11 x 1.97 per cent =) 21.6 per cent. Some children will move a number of times; others won't move at all. Each time a child crosses borders where there are structural barriers there is a risk that they will fall out of alignment with the cohort that they left behind – resulting in them having to 'skip' or 'repeat' a year of schooling.

(e) Differences in the age of first eligibility for school entry are considered as a barrier among jurisdictions. So too are differences in nomenclature if they lead to confusion. The proportion of gross flows between States and Territories encountering different school starting ages is calculated as 91 per cent. That is, 9 per cent of the gross flows were between States and Territories that have common school starting ages. This is illustrated in Figure A.3 below – note that it is subtly different from Figure A.2. Traffic between Queensland and Western Australia and the Northern Territory, which have common school starting ages, is now given zero weight. Likewise, traffic between Victoria and the Australian Capital Territory is weighted at zero.

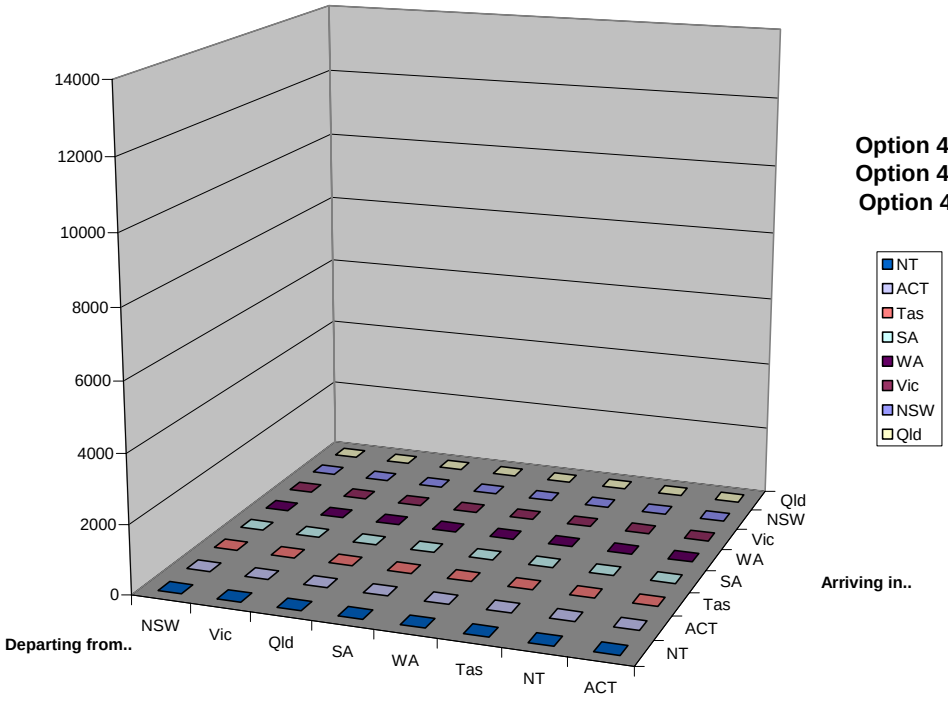
Figure A.3 Gross student flows between jurisdictions with different starting ages (2003-04)



(f) With a probability of each child 'crossing borders' of 21.6 per cent and a probability that when they do so they will encounter a different school starting age (which can be read as a proxy for all potential obstacles) then a 'degree of obstacle' can be calculated as the multiplicand of the two factors. That is, the present system has a degree of obstacle equal to (21.6 per cent x 91 per cent =) 19.6 per cent.

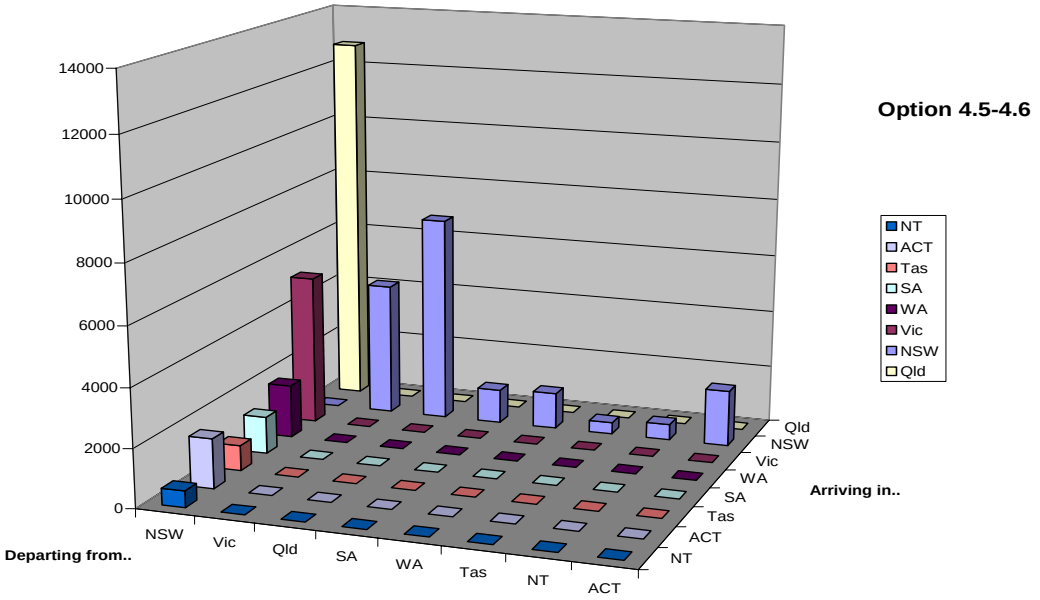
(g) Each of the 'point' options, the 4 years and 5 months option, the 4 years and 6 months option and the 4 years and 8 months option, eliminates *all* of the minimum starting age differences between states and territories and hence *all* of the potential for different minimum school starting ages to disrupt children's schooling. These options provide a degree of obstacle of (21.6 per cent x 0 per cent =) 0 per cent. This is illustrated in Figure A.4 below.

Figure A.4 Common school starting ages remove all potential obstacles to flows between jurisdictions



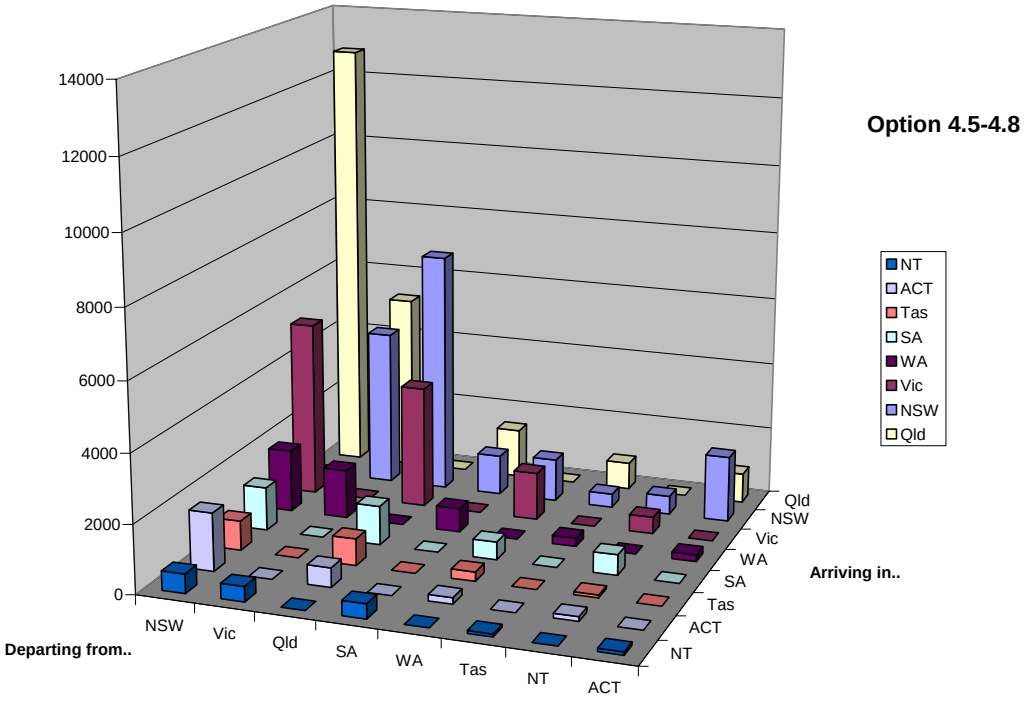
(h) The broad-banded 4 years and 5 months to 4 years and 6 months range option would still leave 55 per cent of gross children flows encountering a different minimum school starting age. It has a degree of obstacle of 11.9 per cent - see Figure A.5.

Figure A.5 Broad-banded option 4.5-4.6 leaves potential obstacles between New South Wales and the rest of Australia



(i) The broad-banded 4 years and 5 months to 4 years and 8 months range option would leave 83 per cent of gross children flows encountering a different school starting age. It has a degree of obstacle of 17.9 per cent - see Figure A.6.

Figure A.6 Broad-banded option 4.5-4.8 leaves numerous potential obstacles



(j) The 'degree of obstacle' is assumed to be negatively associated with the progression of students through the school system. This is the major rationale underlying the proposals for a common minimum school starting age. It is the only educational argument that can be associated with the options. That is, a more integrated school system is expected to increase the average level of education of Australians. The macroeconomic channels through which a more integrated school education system will operate require that the results be translated into a 'years of schooling' equivalent. We have assumed that each percentage point reduction in the 'degree of obstacle', as described above, allows 1 per cent of students who cross borders to complete their schooling within the standard 13 year schooling time period. This assumption is central to quantifying the macroeconomic benefits. Unfortunately, this assumption can only be justified on 'reasonableness' grounds. Although there is a body of anecdote around defence force children, there is no empirical Australia wide research that can be used to defend this assumption.

(k) (i) Given the '1 per cent' assumption explained above, for each of the point options, (the 4 years and 5 months option, the 4 years and 6 months option and the 4 years and 8 months option) the retention rate rises by (-[0 per cent - 19.6 per cent] x 1 per cent =) 0.2 per cent. Note that this is consistent with an additional 500 to 800 or so children each year (out of an annual cohort size of about 260,000) continuing on to complete secondary education who would not otherwise have done so. The Project Reference Group has accepted that this level of outcome, attributable to a common minimum school starting age, supports the case for the '1 per cent' assumption as being reasonable. Over 40 years, that accumulates to a potential in the order of 20,000 more highly skilled workers.

(ii) For the broad-banded 4.5-4.6 option, the retention rate rises by (– [11.9 per cent - 19.6 per cent] x 1 per cent =) 0.08 per cent.

(iii) For the broad-banded 4.5-4.8 option, the retention rate rises by (– [17.9 per cent - 19.6 per cent] x 1 per cent =) 0.02 per cent.

(l) In the analysis above, the model has assumed that there are two extra years of schooling for children continuing their secondary education. Each extra year of schooling is associated with an additional 3.125 percentage points of participation in the labour force. (See Appendix E for details.) This participation rate effect driven by higher retention rates would not begin until children complete higher secondary education, beginning in 2023. The effect would then grow through time in proportion to the cumulating number of post-system change students as a share of the working age population. These benefits would accumulate over the very long run.

(m) There would also be costs to higher retention rates to take account of. The first would be the loss to the economy of a reduced labour force resulting from senior secondary age students who have substituted further schooling in place of paid work. However, youth wages are smaller than that for mature workers, so the loss is less than otherwise. The second would be the cost to society of providing two extra years of schooling. This has been modelled simply as the per capita current secondary spending by Government, indexed for inflation.

(n) There would also be a 'productivity benefit' from higher retention rates. The average level of formal schooling, including tertiary education, for the Australian workforce is estimated (at 2001) at 13.0 years. This was calculated from ABS *Education and Training Indicators (cat. 4230.0)*.

(o) It is assumed that 50 per cent of human productive potential is 'innate'. The rest is assumed to be due to education, a proxy for which is provided by 'years of schooling'.

(p) Human productive potential, or in economic jargon 'human capital', accounts for about two thirds of economic factor income. (Source: ABS Australian National Accounts ABS cat. 5206.0.)

(q) The productivity impact is modelled as: (the assumed change in retention rate {recall I(i)-I(iii) above} x 2 years of extra schooling) / 13 x 50 per cent x 2/3 x accumulating share of post-system change school leavers as a share of the working age population. The impact accumulates over time.

(r) The modelling assumptions and parameters undertaken for this cost/benefit analysis have been found to be consistent with international evidence (discussed in Appendix E) that a one year increase in schooling eventually lifts GDP by 6 per cent.

Appendix B: Cost/Benefit Analysis - The 2010 Baseline

The 2010 baseline scenario brings together each of the datasets discussed in detail in Appendix C.

For example, estimates of New South Wales child attendance in the first 8 years of age for June 2003 are shown in Table B.1. Note that some children will be receiving multiple types of care. This Table is an extract of estimates covering each year of age up to 24.

Table B.1 Estimates of New South Wales child attendance up to 8 years of age[2]

	Age at 1 July 2003	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Pre-school and child care **Children may be in two or more categories*	Outside school hours					392	5,860	7,424	7,496	7,225
	Private long day care	1,390	5,867	16,136	26,891	29,425	5,892	885	752	585
	Community based long day care	1,472	6,075	11,390	13,954	13,260	1,490	56	25	29
	Family day care	2,109	7,223	8,541	7,238	5,139	1,619	1,138	1,019	770
	Pre-school				23,390	37,120	13,802			
	Vacation care					132	2,944	4,491	4,843	4,515
	Informal care	24,353	33,368	33,890	33,210	29,296	27,551	27,807	27,908	28,401
	Parental care only to age 5	57,356	37,241	32,322	22,870	12,068	45,629			
Primary										
	Pre Year 1(c)						71,227	17,430	90	
	Year 1						1,741	68,308	17,880	129
	Year 2						2	1,610	67,320	18,754
	Year 3							3	1,769	68,060
	Year 4								3	1,754
	Year 5								1	6
	Year 6									2
Secondary	Year 7					"5 and under"				1

The estimates in Table B.1 provide the basis for the participation ratios of each age cohort that are assumed would apply in 2010 when the policy options begin to take effect. Details of the relevant calculations are shown in Table B.2 below. The ratios implied by Table B.2 have been adjusted for expected trends to present a picture of where the school sector participation ratios are expected to be in 2010.

[2] Access Economics compiled this Table from sources including FACS and Australian Bureau of Statistics data.

Table B.2 New South Wales participation ratios – Assumptions for June 2010[3]

Participation rates by year of age (= 2003 weights + judgement)										
	Age at 1 July 2003	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Pre-school and child care	Outside school hours					0.4%	6.7%	8.4%		
	Private long day care	1.7%	7.1%	18.5%	30.7%	33.6%	6.8%	1.0%		
	Community based long day care	1.8%	7.4%	13.1%	15.9%	15.2%	1.7%	0.1%		
	Family day care	2.5%	8.8%	9.8%	8.3%	5.9%	1.9%	1.3%		
	Pre-school				26.7%	42.4%	15.9%			
	Vacation care					0.2%	3.4%	5.1%		
	Informal care	29.0%	40.5%	38.9%	37.9%	33.5%	31.7%	31.3%		
	Parental care only to age 5	68.3%	45.2%	37.1%	26.1%	13.8%	52.5%			
Primary						8.3%	100.0%	100.0%	100.0%	100.0%
Secondary										
Post-School	TAFE									
	University									
Employment	Full Time									
	Part Time									
Assumed school retention rate (2010 cohort)							100.0%	100.0%	100.0%	100.0%
Assumed school participation rate (2010 cohort)						8.3%			100.0%	100.0%
Apparent school retention rate (Jun 02)									99.3%	100.4%
Apparent school participation rate (Jun 02)								99.2%	98.5%	98.9%
Govt/total (Jun 02)						73.1%	73.1%	71.2%	71.3%	71.9%
Govt/total (Jun 10)						71.0%	71.0%	71.0%	71.0%	71.0%
Catholic/non-govt (Jun 10)						68.9%	68.9%	68.9%	68.9%	68.9%

Note the assumptions (in shaded boxes) made for school retention rates and splits of government, independent and Catholic primary and secondary schooling.

The following additional assumptions were made in bringing this dataset up to 2010, the first year of planned implementation of the changes to minimum school starting age and nomenclature.

The cost benefit assumption has applied detailed bottom-up estimates of the government school enrolment share by state and territory in 2010. These bottom-up estimates are consistent with national enrolment shares as indicated in

[3] Access Economics compiled this Table from sources including FACS and Australian Bureau of Statistics data.

Table B.3. These results are compared with Productivity Commission assessments, as published in a recent report on the impacts of ageing on the economy[4].

[4] Note that the estimates attributed to the PC for 2010 are *consistent* with the assumptions used by the PC in its report, but are not actually PC estimates.

Table B.3 Assumptions about Enrolment Shares

Enrolment shares	PC 2002-03	CBA 2002-03	PC 2010-11	CBA 2010-11
Government	69%	69%	65%	67%
Non-Government	31%	31%	35%	33%

Source: Productivity Commission (2004), "Results.xls"

The increased size of the introductory cohort have been allocated between 'government' and 'private' (non-government) with 'private' (non-government) further allocated between Catholic and independent schools. The model assumptions are indicated in Table B.4 and are based on the 2003 Schools census.

Table B.4 Modelling assumptions of distribution of 2010 cohort bubble

	Government/private split		Catholic/independent split	
	Primary	*Secondary*	*Primary*	*Secondary*
NSW	71%	63%	69%	64%
VIC	69%	60%	72%	55%
QLD	75%	64%	62%	51%
SA	69%	63%	57%	52%
WA	73%	62%	64%	52%
TAS	78%	70%	65%	56%
NT	79%	73%	64%	46%
ACT	64%	57%	76%	69%

Source: Results.xls, cell B185

This Table is derived from data in Australian Bureau of Statistics 4221.0 Schools Australia, 2003.

Appendix C: Cost/Benefit Analysis - How the Dataset was Compiled

This cost benefit analysis draws on a variety of data sets from a number of sources. Not all of the data sets are necessarily consistent with each other. Compilation of a consistent national set represents a potential 'bottomless pit' in terms of gaining full confidence in each of the data points. Given the huge range of data and the number of assumptions required in modelling the cost benefit analysis, there will always be scope to improve on these estimates.

Put another way, within the overall cost benefit analysis, there is *another* cost benefit analysis concerning the compilation of the underlying dataset. At each point we have had to ask ourselves, what would greater accuracy in a particular aspect of the underlying dataset add to the analysis? If some of the data and/or assumptions were to be improved upon, is it likely that it could result in a re-ranking of the desirability of the options?

So as to ensure that this Project delivered the best value for money, much effort has been devoted to maintaining a high degree of integrity in the dataset by applying, wherever possible, common data and common methodology across jurisdictions and options. The dataset is transparent – it is 'open for inspection'.

In the development of the modelling it is apparent that, as the underlying data and/or assumptions have been improved upon, these improvements tend to affect each of the jurisdictions and each of the options in a reasonably predictable way.

Population projections

Population projections allow the model to incorporate standardised, nationally consistent assumptions around the likely cohort effects of changing school starting ages. The ABS population projections (ABS cat. 3222.0) have a major advantage in that they take into account births, deaths, interstate and international migration on a nationally consistent basis.

The key assumptions underpinning the ABS' alternative demographic scenarios (Series A, B and C) in its population projections series (ABS cat. 3222.0) are provided in Table C.1.

Table C.1 Key demographic assumptions in ABS population projections (cat. 3222.0)

	Total fertility rate (a)		Life expectancy at birth years (c)		Population at 30 June	
	Babies per woman	Net overseas migration (b)	Males	Females	2051 (million)	2101 (million)
Series A	1.8	125,000	92.2	95.0	31.4	37.7
Series B*	1.6	100,000	84.2	87.7	26.4	26.4
Series C	1.4	70,000	84.2	87.7	23.0	18.9

*Preferred series (a) From 2011 (b) From 2005-06 (c) From 2050-51

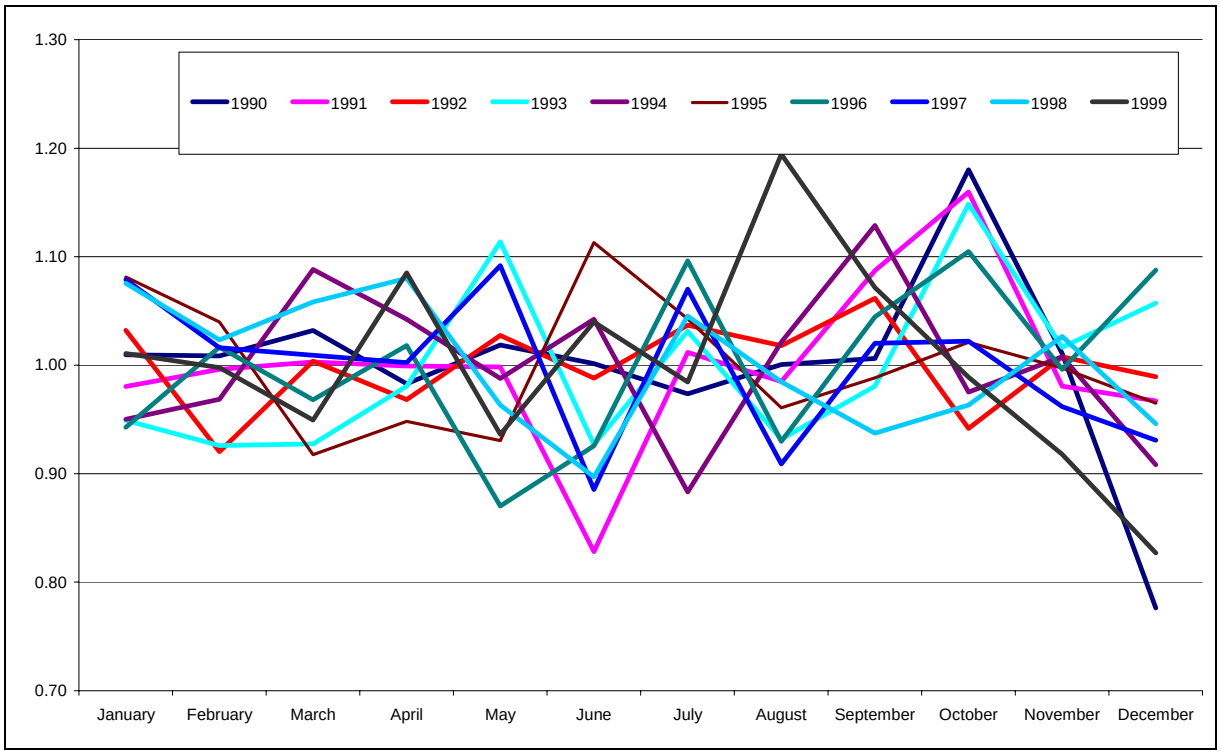
Series B has provided the basis for previous intergenerational policy modelling including the Commonwealth's *Intergenerational Report* (2002). Therefore, Series B has been used in this project.

Nonetheless, there are two concerns with the ABS projections for the purposes of this project. First, there is an issue about whether the annual estimates of cohort sizes should be adjusted for 'through the year' fertility effects – that is, that babies are predictably and disproportionately born in some months more than other months. The ABS projections series provide an annual estimate and are therefore neutral on this matter.

A statistical analysis suggests that there is unlikely to be a regular predictable pattern. For example, the Australian Capital Territory birth relativities from 1990 to 1999 are shown in Figure C.1. The estimates show the number of births in each day in January over the total number of

births per day in that year. Thus in 1992, January births were 3.2% up on the yearly average, but in 1994, they were 5% down. Analysis of relative errors suggests there is no consistent pattern.

Figure C.1 ACT birth relativities 1990 to 1999



The second issue is whether adjustments should be made for the fact that actual births of the cohort at the forefront of the policies under consideration will vary from the official ABS projections. The range of birthdates that are relevant to this project are for those children who will be 4 years and 5 months (in NSW) through to 5 years old (Tasmania) on 31 December 2009.

A baby born in June 2005 will be 4 years and 6 months old on 31 December 2009. One born in July will be 4 years 5 months. The affected cohort is being born as the policy options are being considered. When the next ABS population projections series is published, it is likely that the ABS will use a total fertility rate of 1.75 babies per woman in its central scenario (from 2011).

Macroeconomic baseline scenario

Commonwealth Treasury Intergenerational Report assumptions for employment growth, labour productivity growth and inflation have been assumed in this Project.

The Treasury report did not extend beyond 2041-42. This project extends to 2071-72. For the period from 2041-42 to 2071-72, there are assumptions of no change in the inflation scenario (2.5% pa), no change in the productivity growth scenario (1.75% pa) and employment growth rising at the same rate as ABS Series B population growth (which declines to 0% pa beyond 2051).

Sectoral data sets

Data has been drawn from a variety of nationally consistent data sets to provide a comprehensive picture of care/education/training arrangements for youth in each jurisdiction from birth through to age 24 as at June 2003.

As this data set appears to be unique, it will likely be subject to further revision as better information becomes available. Throughout the model, the data across these sectors should be regarded as illustrative of the possible impacts, rather than definitive.

The data set underlying each sector is discussed below. For the sake of illustration, all examples in this exposition are from New South Wales. Similar datasets have been compiled for all other states and territories.

Childcare sector

Significant impacts from the proposals under consideration will be with the child care sector. The following describes the approach taken to building a nationally consistent data set of each jurisdiction's child care service providers.

There are two broad national datasets relevant to the modelling of child care in the CBA.

The ABS Child Care survey (cat. 4402.0) was last released in May 2003. It was conducted in June 2002 (in conjunction with the monthly labour force survey) and is summarised in Table C.2.

Table C.2 ABS survey data June 2002

ABS cat 4402.0 (June 2002) '('000s)	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Australia
Before/after school care	47.3	51.5	38.8	13.6	11.5	1.6	1.5	5.3	171.1
Long day care	95.2	63.8	79.3	19.4	25.0	5.2	3.1	5.9	296.9
Family day care	28.4	24.7	17.9	6.0	10.4	4.8	1.6	2.0	95.8
Occasional care	9.9	14.3	3.4	2.7	1.7	1.6	0.5	2.3	36.4
Preschool	73.5	62.1	53.3	17.4	22.4	6.2	1.4	3.0	239.3
Other formal care	3.7	3.6	2.2	0.8	0.7	0.4	0.0	0.4	11.8
Informal care	337.2	237.6	192.0	89.8	108.6	27.1	8.9	18.1	1019.3
A. Child population (0-11) June 2002 cat 4402.0	1047.2	751.9	607.5	226.1	311.2	75.6	30.0	50.5	3100.0
B. Child population (0-11) June 2002 cat 3222.0	1066.4	765.0	620.8	229.2	315.1	77.4	41.6	51.4	3166.8
C. Child population (0-11) June 2003 cat 3222.0	1058.8	761.8	623.6	226.9	313.5	76.3	41.4	51.0	3153.3
D. Child population (0-11) June 2004 cat 3222.0	1051.5	757.8	625.1	224.1	312.5	75.2	41.3	50.7	3138.3

The estimated number of children (age 0 to 11) in receipt of each type of care at June 2002 was relative to a then estimated population as shown at line A. Population estimates have been subsequently revised for June 2002 (line B) in the most recent population estimates and projections publications (ABS cat 3222.0). The estimates for June 2003 and June 2004 are shown at lines C and D respectively. These lines are used to bring the different data sets to a common year.

Lines A and C can be used to infer what the ABS survey *might have* revealed had the survey been conducted in June 2003 (in the absence of any other changes). For example, the number of NSW children in receipt of informal care at June 2003 can be estimated as 337.2 thousand x 1058.8 / 1047.2 = 340.9 thousand. That is, the original June 2002 estimate is scaled up (or down) according to the difference in the then estimated population (NSW children aged 0-11) versus the current estimate for the same population as at June 2003.

A second source of child care data lies with the Commonwealth Department of Family and Community Services (FACS).

FACS compiles a census of child care service *providers*. The 2002 census was conducted mainly in May 2002 (with the exception of vacation care services which were varied from June to July 2002 to take account of actual school holidays in each State/Territory). This source is narrower in scope than the ABS survey as it excludes informal care services and formal care services for which there are no Commonwealth payments – specifically 'pre-schools'. On the other hand this data source is capable of providing greater detail regarding specific Commonwealth programmes.

In July 2005, FACS released its census for 2004 – the main results are in Table C.3.

Table C.3 FACS census June 2004

'('000s)	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Australia
Before/after school care	42.2	48.7	47.0	23.5	7.7	4.1	1.9	5.1	180.2
Long day care	135.6	79.6	124.9	26.0	39.2	7.9	3.5	6.9	423.4
Family day care	36.0	28.5	23.5	10.5	8.7	6.2	1.0	2.1	116.5
Occasional care	3.9	3.0	1.6	0.3	1.2	0.3	0.0	0.2	10.5
Vacation care	26.4	24.1	31.4	15.0	8.1	3.8	1.8	1.9	112.5

These three data sets (ABS, FACS 2002 and FACS 2004) have been combined to provide benchmark estimates of the number of children in each jurisdiction in receipt of the different types of child care – see Table C.4.

Table C.4 Combined Data Set for June 2003

'('000s)	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Australia	Comments/judgements
Before/after school care	42.5	48.9	46.9	23.8	7.7	4.2	1.9	5.2	181.0	*Scaled FACS census 2004*
Long day care	136.5	80.0	124.6	26.3	39.3	8.0	3.5	7.0	425.1	*Scaled FACS census 2004*
Private long day care	88.7	47.0	101.8	11.0	25.9	1.5	1.0	3.0	279.9	*Split according to FACS census 2002*
Community-based long day care	47.8	32.9	22.8	15.3	13.4	6.5	2.5	4.0	145.2	*Split according to FACS census 2002*
Family day care	36.3	28.6	23.5	10.6	8.7	6.3	1.0	2.1	117.1	*Scaled FACS census 2004*
Preschool	74.3	62.9	54.7	17.5	22.6	6.3	1.9	3.0	243.2	*Scaled ABS survey (not covered by FACS)*
Other formal care	28.8	25.3	32.9	15.8	9.4	4.3	2.5	1.9	121.0	*Scaled FACS census (2002 and 2004)*
Vacation care	26.6	24.2	31.3	15.2	8.1	3.9	1.8	1.9	113.0	*Scaled FACS census 2004*
Informal care	340.9	240.7	197.1	90.1	109.4	27.4	12.3	18.3	1036.2	*Scaled ABS survey*
Child population (0-11)	1058.8	761.8	623.6	226.9	313.5	76.3	41.4	51.0	3153.3	*ABS survey*

The 2004 FACS data – which became public towards the end of this Project – was used to inform the aggregates. However, long day care numbers have been split into private and community-based components according to the 2002 FACS census. Likewise, the 2002 FACS census was used to estimate the age distribution of children covered by Out-of-school-hours Care (OSH), Vacation Care, Family Day Care and Long Day Care by State and Territory.

It has not been feasible to fully update this dataset for the 2004 FACS census.

Other datasets – such as the National Accounts and the Schools census – are similarly a 'moving feast'. More recent data move a little closer to 2010 when the CSSA policy changes are scheduled to take effect, but new data does not represent the system that is likely to be in place in 2010. In the event the sensitivity of the results to a 100% increase in pre-primary formal care costs were tested to assess whether the rankings of the options would be changed by such a scenario. The rankings did not change.

'Occasional care' is a very minor item and has not been modelled.

ABS estimates for 'other formal care' are unique. The FACS data set provides no information on this group. Informal care includes care by grandparents and immediate family (and other people) but does not include parental care. Again this estimate has been scaled for population changes.

The judgements that were made in combining these data sets are summarised in the last column to Table C.4. Detailed examination of the FACS census of child care services was undertaken in modelling each of the following sectors for each state and territory.

'Before/after school care' or 'outside-school-hours' (OSH) care sector

The 2002 FACS census provides details of the age split of children in receipt of a number of types of child care. The calculations that were undertaken to estimate gross OSH spending is illustrated with the case of NSW in Table C.5 below. Table references are to the 2002 FACS census.

Whereas FACS estimated 34,615 children in receipt of OSH in June 2002, the adjusted estimate (drawing from the latest FACS estimate for June 2004) but scaled to June 2003 has been drawn

from Table 11 of the FACS data set. This total (42,488 at Line A) has been allocated to each age year on the same proportionate basis as was the case when FACS undertook the childcare provider census in May/June 2002. Thus 392 children were estimated to be in receipt of OSH in New South Wales who were aged less than 5 at June 2003. With assumed average ages of each cohort, it is possible to estimate the average age of all children in New South Wales OSH as the weighted sum of the last two columns – this suggests that the average age of OSH children was 10 (the box on Line A).

FACS reported fees for 'before school' and 'after school' care in mid-2002 – see lines D and E respectively. The estimates are for mid-2002. To make these dollar estimates consistent with financial year 2003-04, a mark-up factor has been applied (Line B) that uplifts the dollar estimates by estimated inflation in the child care sector in the 18 months from mid-2002 and end-2003.

The assumed mark-up is the growth in the national Gross National Expenditure (GNE) deflator between June quarter 2002 and December quarter 2003. Note that for the benchmark (financial) year 2003-04, 'quantities' are centred at its beginning (in mid-2003) while 'prices' are centred in the middle (end-2003). Ideally, quantities would also be centred in the middle of the financial year. However a minor compromise was made so as to facilitate the easy use of the major 'quantity' data sources (ABS population projections, schools census data and child care statistics).

Children attending 'before school' OSH did so more often (3.23 days per week) than children attending 'after school' OSH (2.86 days per week), as suggested by the calculations culminating in Line N.

Multiplying the fees for 'before school' and 'after school' by average use and allowing for a mark-up in costs to December 2003 suggests typical fees of (3.23 x $6.82) + (2.86 x $10.87) x (1 + 4.1%) = $53.51 per week. Average child attendance was 8.9 hours per week (Line F), suggesting an average cost per child hour attendance of $53.51/8.9 = $6.01 (Line M).

Other calculations are suggested by this dataset:

- Total child hours attended per week (Line G = Line A x Line F).
- Implied staff numbers: Line H takes estimate for June 2002 (2,978) and scales this up by revised child care numbers – that is 42,488/34,615 – to get 3,655 (Line H).
- Total hours worked (Line J = Line H x Line I).
- Implied child to staff ratio (Line K = Line G / Line J).
- Total OSH cost in 2003-04 (Line O = Line A x Line B x Line L).
- Annual cost per child in OSH (Line P = Line O / Line A).

Similar tables have been compiled for each of the other states and territories.

Table C.5 Outside school hours care calculations

NSW			
Before/after school care			Average
[aka OSH]	FACS	Adjusted	age
Number of children {Table 8.2.2}	Jun-02	Jun-03	
< 5 yrs	0.319	0.392	4.5
5 yrs	4.774	5.860	5.5
6 yrs	6.048	7.424	6.5
7 yrs	6.107	7.496	7.5
8 yrs	5.886	7.225	8.5
9 yrs	4.788	5.877	9.5
10 yrs	3.881	4.764	10.5
11 yrs	2.314	2.840	11.5
12 years	0.480	0.589	12.5
13 + yrs	0.018	0.022	13.5
A. Total	34.615	42.488	10.0
B. Average fees per week (Dec 2003)		$ 53.51	= ([C] x [N]) x (1 + C)
C. Growth in gross fees (June 02 to Dec 03)		4.1%	GNE deflator growth
D. Average regular fee before school (Jun 02)		$ 6.82	Table 8.1.3
E. Average regular fee after school (Jun 02)		$ 10.27	Table 8.1.8
F. Average child attendance (hrs per week)		8.900	Table 8.2.5
G. Total hours (million per week)		0.378	= A x F
H. Staff	2.978	3.655	Table 8.3.5
I. Average hours worked per week		14.200	Table 8.3.5
J. Total hours worked (million per week)		0.052	= H x I
K. Implied child: staff ratio		7.285	= G / J
L. Median weeks of operation		41	Table 8.1.1
M. Cost per child hour attendance (Dec 03)		$ 6.01	= B / F
	Before	After	
Number of days attended pw	school	school	
	Table 8.2.3	Table 8.2.4	
1	19%	25%	
2	18%	22%	
3	17%	18%	
4	13%	12%	
5	33%	23%	
N. Weighted average days pw	3.23	2.86	
O. Cost per year ($m 2003-04)		$ 93	= A x B x L
P. Annual cost per child (2003-04)		$ 2,194	= O / A

Private long day care sector

As with OSH, the 2002 FACS census is used to allocate use of private long day care by age. Details are provided in Table C.6.

At line A, the adjusted total number of New South Wales children in private long day care is drawn, as before, from Table C.6. Average total fees have been reported as $193 per week. Fees by age have also been reported – the weighted sum of these fees by age is $193.85, very

close to the total average reported. The average fee refers to full time use of the facilities – assumed to be 50 hours per week.

As before, a number of inferences can be drawn from the dataset.

- Total child hours attended per week (Line F = Line A x Line E)
- Implied staff numbers: Line G takes estimate for June 2002 (8,334) and scales this up by revised child care numbers – that is 88,718/70,860 – to obtain 10,434.
- Total hours worked (Line I = Line G x Line H)
- Implied child to staff ratio (Line J = Line F / Line I)
- Total private long day care spending in 2003-04 (Line M = Line A x Line E x Line K x Line L)
- Annual cost per child in New South Wales Private Long Day Care (Line N = Line M / Line A)

Table C.6 Private long day care calculations

NSW				
Private long day care			Average	Average
	FACS	Adjusted	weekly fee	age
Number of children {Table 4.2.2}	Jun-02	Jun-03	{Table 4.1.3}	
< 1 year	1.110	1.390		0.5
1 yrs	4.686	5.867	$ 226	1.5
2 yrs	12.888	16.136	$ 197	2.5
3 yrs	21.478	26.891	$ 190	3.5
4 yrs	23.502	29.425	$ 190	4.5
5 yrs	4.706	5.892	$ 190	5.5
6 yrs	0.707	0.885		6.5
7 yrs	0.601	0.752		7.5
8 yrs	0.467	0.585		8.5
9 yrs	0.314	0.393		9.5
10 yrs	0.232	0.290		10.5
11 yrs	0.126	0.158		11.5
12 years +	0.043	0.054		12.5
A. Total	70.860	88.718	$ 193.00	3.8
B. Average fee suggested by kids age structure (June 02)			$ 193.85	
B2. Hours of operation		50	Assumption	
C. Average fees per week (Dec 2003)		$ 200.91	= A x (1 + D)	
D. Growth in gross fees (June 02 to Dec 03)		4.1%		
E. Average child attendance (hrs per week)*		18.633	Table 4.2.3	
F. Total hours (million per week)		1.653	= A x E	
G. Staff	8.334	10.434	Table 4.3.5	
H. Average hours worked per week		28.717	Table 4.3.5	
I. Total hours worked (million per week)		0.300	= G x H	
J. Implied child: staff ratio		5.517	= F / I	
K. Median weeks of operation		50	Table 4.1.1	
L. Cost per child hour attendance (Dec 03)		$ 4.02	= C / B2	
M. Cost per year ($m 2003-04)		$ 332	= A x E x K x L	
N. Annual cost per child (2003-04)		$ 3,744	= M / A	
*Note that because the distribution has a 'long tail', the median is smaller than the average.				
The median for all long day care centres was reported in the ABS survey as 16 hours per week.				

Community-based long day care sector

The methodology for obtaining community-based long day care estimates is identical for that used for private long day care. Table C.7 provides details, illustrated with the case of New South Wales.

Table C.7 Community based long day care calculations

NSW				
Community based long day care			Average	Average
	FACS	Adjusted	weekly fee	age
Number of children {Table 5.2.2}	Jun-02	Jun-03	{Table 5.1.3}	
< 1 year	1.176	1.472		0.5
1 yrs	4.852	6.075	$ 208	1.5
2 yrs	9.097	11.390	$ 204	2.5
3 yrs	11.145	13.954	$ 198	3.5
4 yrs	10.591	13.260	$ 198	4.5
5 yrs	1.190	1.490	$ 198	5.5
6 yrs	0.045	0.056		6.5
7 yrs	0.020	0.025		7.5
8 yrs	0.023	0.029		8.5
9 yrs	0.018	0.023		9.5
10 yrs	0.003	0.004		10.5
11 yrs	0.004	0.005		11.5
12 years +	0.002	0.003		12.5
A. Total	38.166	47.784	$ 201	3.3
B. Average fee suggested by kids age structure (Jun 02)			$ 200.80	
B2. Hours of operation		50	Assumption	
C. Average fees per week (Dec 2003)		$ 209.24	= A x (1 + D)	
D. Growth in gross fees (June 02 to Dec 03)		4.1%		
E. Average child attendance (hrs per week)*		19.683	Table 5.2.3	
F. Total hours (million per week)		0.941	= A x E	
G. Staff	6.759	8.462	Table 5.3.5	
H. Average hours worked per week		26.200	Table 5.3.5	
I. Total hours worked (million per week)		0.222	= G x H	
J. Implied child: staff ratio		4.242	= F / I	
K. Median weeks of operation		50	Table 5.1.1	
L. Cost per child hour attendance (Dec 03)		$ 4.18	= C / B2	
M. Cost per year ($m 2003-04)		$ 197	= A x E x K x L	
N. Annual cost per child (2003-04)		$ 4,119	= M / A	
*Note that because the distribution has a 'long tail', the median is smaller than the average.				
The median for all long day care centres was reported in the ABS survey as 16 hours per week.				

Family day care sector

An identical methodology is applied to this sector as with the previous sectors. Note the memorandum item at Line H – caregivers are distinguished from the staff of family day care centres.

Table C.8 Family day care calculations

NSW				
Family day care			Average	Average
	FACS	Adjusted	weekly fee	age
Number of children {Table 6.2.2}	Jun-02	Jun-03	{Table 6.1.1}	
< 1 year	1.712	2.109		0.5
1 yrs	5.864	7.223		1.5
2 yrs	6.934	8.541		2.5
3 yrs	5.876	7.238		3.5
4 yrs	4.172	5.139		4.5
5 yrs	1.314	1.619		5.5
6 yrs	0.924	1.138		6.5
7 yrs	0.827	1.019		7.5
8 yrs	0.625	0.770		8.5
9 yrs	0.526	0.648		9.5
10 yrs	0.345	0.425		10.5
11 yrs	0.216	0.266		11.5
12 years +	0.113	0.139		12.5
A. Total	29.448	36.272	$ 172	3.5
A2. Hours of operation		50	Assumption	
B. Average fees per week (Dec 2003)		$ 179.05	= A x (1 + C)	
C. Growth in gross fees (June 02 to Dec 03)		4.1%		
D. Average child attendance (hrs per week)		18.883	Table 6.2.3	
E. Total hours (million per week)		0.685	= A x D	
F. Staff	0.617	0.760	Table 6.3.5	
G. Average hours worked per week		26.433	Table 6.3.5	
H. Total caregivers	3.848	4.740	Table 6.4.4	
I. Average hours worked per week		44.117	Table 6.4.4	
J. Total hours worked (million per week)		0.223	= (D x F) + (H x I)	
K. Implied child: staff ratio		3.065	= E / I	
L. Median weeks of operation		50	Table 5.1.1	
M. Cost per child hour attendance (Dec 03)		$ 3.58	= B / A2	
N. Cost per year ($m 2003-04)		$ 123	= A x D x L x M	
O. Annual cost per child (2003-04)		$ 3,381	= N / A	

Pre-school sector

Total pre-school numbers have been drawn from the ABS survey. The allocation of pre-school numbers by year of children's age is taken from the 2001 Census of Population and Housing which provides estimates of pre-school attendance by year of age of child by jurisdiction. This provides an age distribution of pre-school attendance. Pre-school fees have been assumed to be the same as for private long day care in each jurisdiction.

Table C.9 Pre-school calculations

NSW			
Pre-school*			Average
		Jun-03	weekly fee
Number of children			
< 1 year			
1 yrs			
2 yrs			
3 yrs		23.390	
4 yrs		37.120	
5 yrs		13.802	
6 yrs			
7 yrs			
8 yrs			
9 yrs			
10 yrs			
11 yrs			
12 years +			
A. Total		74.312	$ 201
*Data is not available from FACS census			
Estimates based on ABS childcare survey, 2001 census and FACS private long day care			
B. Average child attendance (hrs per week)*		10	Table 6, 4402.0
C. Total hours (million per week)		0.743	= A x B
D. Staff		4.691	= C / (E x G)
E. Average hours worked per week		28.717	As for private long day care
F. Total hours worked (million per week)		0.135	= D x E
G. Assumed child: staff ratio		5.517	As for private long day care
H. Median weeks of operation		40	By assumption
I. Cost per child hour attendance (Dec 03)		$ 4.02	As for private long day care
J. Cost per year ($m 2003-04)		$ 119	= A x B x H x I
K. Annual cost per child (2003-04)		$ 1,607	= J / A

Vacation care services sector

The methodology used for this sector is the same as for the other FACS-driven sectors. However note that average child attendance was calculated as follows:

Centres operated during vacation periods, which in the case of New South Wales for example meant that 57% of centres operated from 10-12 weeks a year. Half of New South Wales vacation care service centres operated from 10-11 hours a day, or 50-55 hours per week. New South Wales children attending vacation are services attended on average 2.8 days per vacation week.

On this basis, it has been assumed that average New South Wales child attendance was 2.8/5*50*70% = 19.6 hours per vacation week. The '70%' discounts for the fact that not all children will be in attendance for all of the opening hours of the vacation centre. The implied hourly care rate using the 70% assumption is in line with the OSH hourly rate, which is likely to have a similar cost structure to vacation care.

Table C.10 Vacation care calculations

NSW				
Vacation care			Average	Average
	FACS	Adjusted	weekly fee	age
Number of children {Table 9.2.2}	Jun-02	Jun-03	{Table 9.1.3}	
< 5 years	0.113	0.132		4.5
5 yrs	2.520	2.944		5.5
6 yrs	3.844	4.491		6.5
7 yrs	4.145	4.843		7.5
8 yrs	3.864	4.515		8.5
9 yrs	3.201	3.740		9.5
10 yrs	2.498	2.919		10.5
11 yrs	1.734	2.026		11.5
12 yrs	0.653	0.763		12.5
13+ yrs	0.195	0.228		13.5
A. Total	22.767	26.600	$ 123	8.4
B. Average fees per week (Dec 2003)		$128.04	= A x (1 + C)	
C. Growth in gross fees (June 02 to Dec 03)		4.1%		
D. Average child attendance (hrs per week)		19.600	Table 9.2.3	
E. Total hours (million per week)		0.521	= A x D	
F. Staff	2.888	3.374	Table 9.3.4	
G. Average hours worked per week		23.750	Table 9.3.4	
H. Total hours worked (million per week)		0.069	= F x G	
I. Implied child: staff ratio		7.601	= E / H	
J. Median weeks of operation		10	Table 9.1.1	
K. Cost per child hour attendance (Dec 03)		$ 6.28	= A / D	
L. Cost per year ($m 2003-04)		$ 34	= A x B x J	
M. Annual cost per child (2003-04)		$ 1,280	= L / A	

Informal care sector

The ABS child care survey provides information on children in receipt of informal care – by jurisdiction and by age. Estimates for June 2003 were obtained by multiplying the estimated New South Wales June 2003 population (by age) by the national age-specific ratio in receipt of informal care adjusted for the NSW-specific use of informal care, which is slightly lower than the national average.

A particular difficulty is what to assume for the 'cost per child hour of informal care'. From ABS cat 4402.0 data it is clear that nearly all informal care is undertaken by family members, especially grand parents. Recall that the ABS definition of informal care specifically excludes parental care.

To the extent that family members – or even friends – regard the task of informal care as a bonus (what is termed in the Report as 'psychological benefits') then the *net* social cost of informal care is reduced. That argues for a deliberately conservative price to be attributed to informal care.

Many of the 'costs' would take the form of inter-family trading of favours. That is, payment may not be in cash. Nonetheless, in concept, the monetary value of the 'favours', if they could be estimated, would be included in the measure.

For this Project, an assumption of $1 per hour has been made. This is above zero, but well below the average hourly wage. As this is a minor item in the wider costs and benefits, the rankings of the options are insensitive to much higher assumptions for this figure.

Table C.11 Informal care calculations

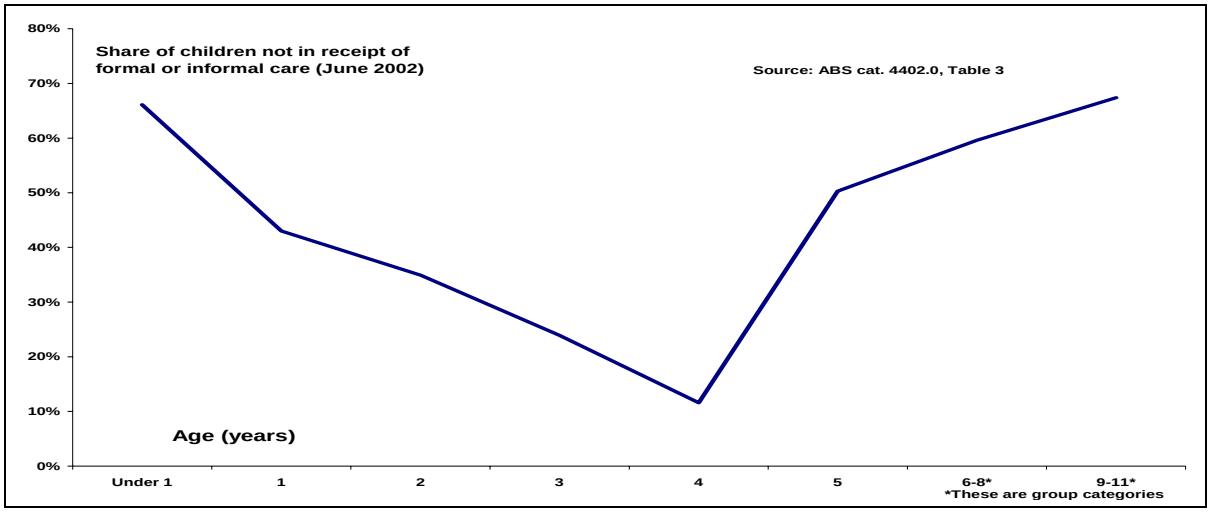
NSW			
Informal care (ABS)			Average
	A. Number of children		age
Number of kids			
< 1 year	24.4		0.5
1 yrs	33.4		1.5
2 yrs	33.9		2.5
3 yrs	33.2		3.5
4 yrs	29.3		4.5
5 yrs	27.6		5.5
6 yrs	27.8		6.5
7 yrs	27.9		7.5
8 yrs	28.4		8.5
9 yrs	24.8		9.5
10 yrs	25.0		10.5
11 yrs	25.2		11.5
B. Total	340.7		5.8
C. Average child attendance (hrs per week)		7.000	Table 6, 4402.0
D. Total hours (million per week)		2.385	= B / C
E. Median weeks of operation		48	By assumption
F. Cost per child hour attendance* (Dec 03)		$ 1.00	By assumption
G. Cost per year ($m, 2003-04)		$ 114	= D x E x F
H. Annual cost per child (2003-04)		$ 336	= G / B
*Net of psychological benefits			

Parental care sector

The ABS survey child care provides information on children in receipt of neither formal nor informal care. The data is provided by jurisdiction and by age. The pattern suggested by the survey is shown in Figure C.2.

The interpretation put on the figure is that if the children represented in Figure C.2 receive *any* kind of care it must be from their parents or from universal schooling. That would explain the 'V shape': babies are likely to be in receipt of parental care, while older children are likely to be in the school system.

Figure C.2 Children reliant on parental care only



The figure suggests that as children age from 4 to 5, up to 40% of parents will be relieved from being the sole care provider for their child.

Parents of course may have younger children to care for. The number of babies that an Australian woman (both childbearing and childless) is expected to have is currently around 1.75. Based on the 1996 Midwives Collection 72% of all women will have a first birth, therefore implying that 28% of women will not have children. That suggests for women who have babies, the average number of children is about (1.75/72% =) 2.43. If we assume that the proportion of families where there are gaps of more than 5 years between the birth dates of the children is likely to be small then the probability that a school age child does not have a younger brother or sister at home has been estimated for the purposes of this cost-benefit analysis at (1 / 2.43 =) 41%.

Otherwise parents may choose to spend that time away from their child as a 'holiday' or enter the workforce.

When parents re-enter the workforce, we may value the total benefits to the community as equal to the gross wage that they might expect (calculated here as the average hourly wage rate at June 2003 ($18.00) x the number of hours the child is in school – say, 30 hours per week for 40 weeks per year). (Some parents will work less than 30 hours per week, others more – our assumed participation rate relates to the equivalent of "30 hours per week 40 weeks per year".) Note that some of those earnings will accrue to the Commonwealth as higher taxation payments (or reduced welfare payments).

There is an argument for deducting from the wage rate an amount equivalent to the loss of contact time that parents place on being with their children for these hours. Note that these hours are at the margin – that is, the parent could potentially still be in direct contact with the child for up to (168 - 35 =) 133 hours per week. Given the remaining high level of potential contact time, the parents' loss of contact time with children is likely to be less than if these were the only hours in the week that parents had contact with their children.

In the model there is an assumption that, at the margin, changes to compulsory schooling arrangements will involve no changes in 'psychological utility' for parents. Note that this is not necessarily inconsistent with the 'psychological benefits' assumption made for informal care above. Grandparents, at the margin, are likely to view favourably limited care arrangements. For example, the data shows that median grandparent care per week is just 6 hours.

What value should we place on the time of those parents who choose not to enter the workforce? A starting point would be the average hourly earnings rate ($18 per hour in

December 2003) that could be earned in employment. However there are arguments for discounting the average hourly earnings rate:

Tax should be deducted. From the parent's point of view they will be trading off (untaxed) leisure versus after-tax workforce earnings. (As discussed below, tax is added back tax on the Commonwealth's account to the extent that the freed-up parent is assumed to re-enter the workforce.) Currently employees face an average tax rate of 25.7%: (the share of Commonwealth tax revenues of GDP in 2003-04 – Source: ABS Cat. 5506.0, released on 19/4/05).

Some of the parents will be enjoying 'economies of scale' in minding more than one child. (The average number of children for each woman who has children is estimated above as 2.43.)

In the event, the model assumes an hourly earnings rate of [(($18 x (1-0.257)) x 41% =] $5.50. That is, the cost-benefit analysis discounts the earnings rate of the care-giving parent in proportion with the probability that their school age child has a younger sibling. (For ease of modelling, the discount has been applied to the *price* of parental care, not the *quantity* – this has no effect in substance.)

This adjustment means that the social valuation of changes in parental child-minding time are valued only to the extent that the parent is likely to move from a situation of sole responsibility for child minding to one where they no longer have any children for whom they might be solely responsible.

Table C.11 provides detailed calculations of 'parental care only' arrangements in NSW for 2003-04. Note further that:

- Estimates for June 2003 were obtained by multiplying the estimated NSW June 2003 population (by age) by the national age-specific ratio in receipt of 'parental care only' adjusted for the New South Wales-specific (which was slightly above the national average) use of 'parental care only'.
- It is assumed that there is one parent caring for each child.
- The cost of parenting for families which make use of any formal and/or informal care are specifically excluded.
- Even with these conservative assumptions, it is clear that child rearing is a huge 'hidden' industry.
- Changes in schooling arrangements have the potential to create major costs/benefits within families. Calculations of those costs/benefits will be sensitive to the assumptions made.

Table C.11 New South Wales parental care only calculations

NSW				
Parental care 'only' to 5 years of age				
	A. Number of children	B. hours per week	C. cost per child	D. Total cost
			per year	= A x C
			= B x D	
< 1 year	57,356	35	$ 7,703	$ 441,839,829
1 yrs	37,241	35	$ 7,703	$ 286,881,149
2 yrs	32,322	35	$ 7,703	$ 248,986,373
3 yrs	22,870	35	$ 7,703	$ 176,178,270
4 yrs	12,068	35	$ 7,703	$ 92,967,817
5 yrs	45,629	35	$ 7,703	$ 351,502,037
A. Sum to 5 years of age	207,486		$ 7,703	$1,598,355,475
E. Total hours (million per week)		7.262	= no . of kids x hours	
F. Median weeks of operation		40	By assumption	
G. Marginal cost per child hour attendance* (Dec 03)		$ 5.50	By assumption	
H. Average (post-tax) hourly earnings (Dec 03)		$ 13.37		
I. Average number of children per care giving parent		2.43	= M / (1 - L)	
*Net of psychological benefits				
J. Cost per year ($m, 2003-04)		$ 1,598		
K. Annual cost per child (2003-04)		$ 7,703		
National assumptions				
L. Proportion of women who will not have babies		28%		
M. Total fertility rate		1.75		
N. Participation rate of freed-up care giving parents		50%		

In addition it is assumed that 50% of freed-up care-giving parents would re-enter the workforce if they were relieved of full-time child minding duties. While there is no available evidence for this assumption, it is known that work-related reasons (as opposed to personal reasons including leisure) comprised 47% of the 'main reasons' that parents with children aged 3 to 8 sought out additional formal care (see ABS Childcare Survey, Table 20). This assumption has a direct benefit for Commonwealth tax revenues but no other effects on the calculation of parental benefits.

The summary impact on parents is presented below in Table C.12. These estimates are based on probabilities that a child in each jurisdiction of a given age will be in the sole care of their parents.

Table C.12 First round parental impacts

	'Parental care only' parents with more (+) or less (-) child minding responsibilities	'Freed up' parents With no younger children	'Freed up' parents Assumed workforce entrants
Option 4.5	-2,890	1189	595
Option 4.6	-1,955	804	402
Option 4.8	9,354	-3849	-1924
Option 4.5 - 4.6	-2,266	932	466
Option 4.5 - 4.8	-11	4	2

Source: Results.xls

School sector

ABS Schools publication (cat. 4221.0) was used to populate the number of children by year of age by grade year for each jurisdiction. This publication is based on the National Schools Statistics Collection (NSSC).

The dataset used in the cost/benefit analysis applied an age reference point at 1 July 2002. While updates on this dataset are now available they do not move the model much closer to estimating what education participation rates are likely to be in 2010 when the policy changes under consideration take effect. There is no cost effectiveness in updating these datasets.

The starting ages need to be translated to end-June so as to be able to anchor the cost/benefit analysis on ABS demographic projections by cohort (and by state and territory) which all relate to end-June.

The central scenario for the model assumes a 'full cohort' effect, as if parents took the earliest opportunity to send their children to school. For example, a '4 years, 5 months [and one day]' (or 4.5) minimum age (as in New South Wales), that means that the minimum age as of end-June of the first universal school year must be six months later (that is, 4.11). Of the 4 year old population at end-June, up to one month's worth of that cohort is over the minimum age. The rest of the first universal year of schooling is made up of 5 year olds up to 5 years and 11 months – the remaining 5 year olds [that is from 5 years 11 months and one day to 6 years minus one day] are assumed to have started universal schooling in the previous year. Calculations for all states and territories are shown in Table C.13.

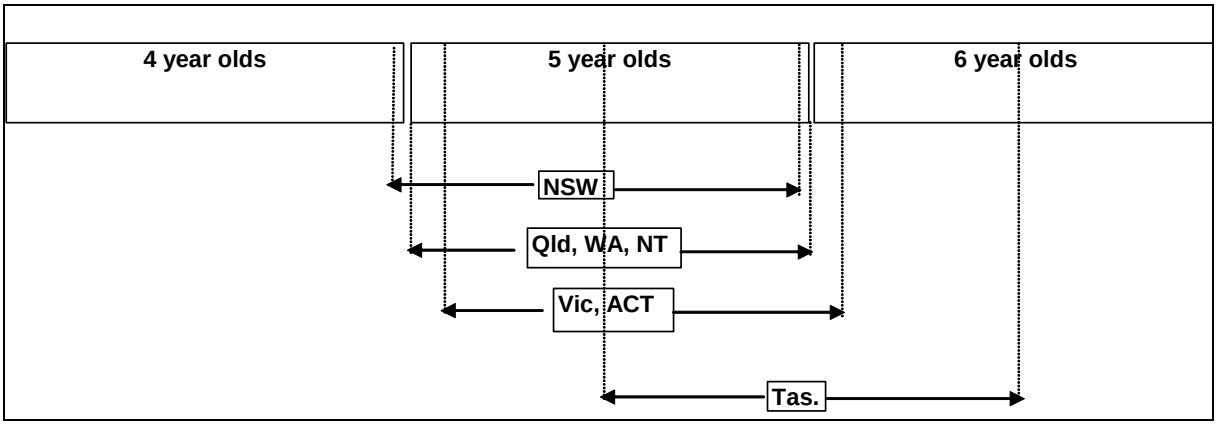
There are particular complications in modelling South Australia's system of rolling intakes, as discussed at Appendix F.

Table C.13 Current starting age impact by cohort and state/territory

States and Territories	Age at end-December (Prior-to-school year)	Age at end-June	Status Quo		
			Months at each age cohort		
			4	5	6
New South Wales	4.5	4.11	1	11	
Victoria	4.8	5.2		10	2
Queensland	4.6	5.0		12	
Western Australia	4.6	5.0		12	
South Australia	4.5	4.11	See Appendix F		
Tasmania	5.0	5.6		6	6
Australian Capital Territory	4.8	5.2		10	2
Northern Territory	4.6	5.0		12	

This is illustrated in Figure C.3.

Figure C.3 How estimates of cohorts translate to first year of universal schooling



The adjustments, in months, required for each cohort by state and territory in changing to each of the major options (4.5, 4.6 and 4.8) are shown in Table C.14.

Table C.14 Changes by cohort and state and territory

	4 years and 5 months option			4 years and 6 months option			4 years and 8 months option		
	4	**5**	**6**	**4**	**5**	**6**	**4**	**5**	**6**
New South Wales	0	0	0	-1	0	0	-1	-2	0
Victoria	1	2	0	0	2	0	0	0	0
Queensland	1	0	0	0	0	0	0	-2	0
Western Australia	1	0	0	0	0	0	0	-2	0
South Australia	See Appendix F								
Tasmania	1	6	0	0	6	0	0	4	0
Australian Capital Territory	1	2	0	0	2	0	0	0	0
Northern Territory	1	0	0	0	0	0	0	-2	0

VET sector

While the Vocational Education Training (VET) sector, typically undertaken in a TAFE or run by a private provider, and higher education sectors remain largely distinct, there are an increasing number of connections being forged between the two. A few universities offer programmes under the National Training Framework (NTF), and some bachelor programmes are offered by mainly VET institutions. Articulation from VET programmes into specific degree-level programmes at universities or vice versa is now well developed with the granting of credit in one sector for studies undertaken in the other. In addition, VET programmes are increasingly being offered within secondary schools.

The estimates for VET participation used in the cost/benefit analysis were compiled by the National Centre for Vocational Education Research Ltd for calendar year 2004 and were released in July 2005. These estimates do not include fee-for-service delivery by private providers. The shaded figures in Table C.15 are from the NCVER National VET Provider Collection.

Table C.15 VET sector use by age group and jurisdiction

Student numbers in 2004	15-19 ('000)	20-24 ('000)	Total students (A) (all age groups) ('000)	Total hours (B) ('000)	Average hours per student (C)=B/A (per year)
NSW	121.0	88.8	518	111644	215.7
VIC	97.7	84.8	481	106314	221.2
QLD	62.8	48.6	279	53795	193.0
SA	21.2	18.9	111	21370	192.0
WA	37.7	21.4	127	31224	246.8
TAS	6.6	5.9	39	7725	200.6
NT	4.2	2.9	20	3925	199.2
ACT	4.7	5.2	22	6401	287.0
Australia	357.9	266.2	1595	342397	**214.6**

Source: *Australian vocational education and training statistics 2005* , NCVER

Note that average student hours differ between the jurisdictions. They are lowest in the Northern Territory and highest in the Australian Capital Territory.

The cost/benefit analysis estimates of VET costs per student, discussed below, are anchored to the notion of a Full Time Equivalent student (or FTE). The NCVER definition of an FTE is 540 hours (or more) per year.

The age group of particular interest for the modelling is that group aged 15-24. The NCVER has not publicly released this data by year of age. Nor is there public data on the average hours by year of cohort by jurisdiction.

Table C.16 shows the assumptions (in terms of FTE) that were made for each jurisdiction by year of age from 15 to 24.

Table C.16 VET sector participation rates used in the CBA

	15 years	16 years	17 years	18 years	19 years	20 years	21 years	22 years	23 years	24 years
NSW	11%	11%	11%	11%	11%	8%	8%	8%	8%	8%
Vic	12%	12%	12%	12%	12%	10%	10%	10%	10%	10%
Qld	8%	8%	8%	8%	8%	6%	6%	6%	6%	6%
SA	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
WA	12%	12%	12%	12%	12%	7%	7%	7%	7%	7%
Tas	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
NT	10%	10%	10%	10%	10%	7%	7%	7%	7%	7%
ACT	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

Other data.xls

By way of example, the first figure in the table (11%) was calculated as:

- 121 thousand 15-19 year old NSW VET students;
- divided by 452 thousand 15-19 year NSW cohort (ABS population series);
- multiplied by 215.7 hours per NSW VET student (from Table C.15);
- divided by 540 hours to get FTE equivalent basis;
- 121 / 452 x 215.7 / 540 = 11%.

University sector

The Australian Government Department of Education, Science and Training provided the Project with the actual number of domestic students by state and territory, by year of age, for 2003. This information was compiled from the Higher Education statistics data set.

ABS Population estimates for June 2003 were used to obtain estimates of the domestic student university participation rate for each year of age from 16 to 24 for each state and territory. This information was built into the cost/benefit analysis model.

Labour force

The publication Labour Force Statistics (ABS cat. 6203.0) was used to compile State/Territory-specific data by year of age (up to the age of 24) for full-time and part-time employment (as distinct from participation) as at June 2003.

Prices

Indexing

Childcare and education costs (per student per year) and wages were indexed by a growth factor reflecting projected movements in inflation and in productivity growth and 2% pa education-specific growth factor on the advice of DEST. The specific growth factor is assumed to apply through to 2023-24, thereafter returning to zero.

Pre-universal schooling

Prices for this sector were discussed above.

Schools

Government-funded underlying recurrent school spending estimates were provided by the Australian Government Department of Education, Science and Training. They are based on data from the 2002 Financial Questionnaire for Catholic and Independent schools collected by DEST, and from the 2002-03 National Schools Statistics Collection for Government schools produced by MCEETYA on information supplied by the States and Territories.

VET

The cost/benefit analysis assumes the average price of a Full Time Equivalent student at $7,430 per annum in 2002-03 (DEST advice 4 July 2005). The Commonwealth Government : State and Territory Government : Private share of VET spending is estimated at 16% : 32% : 52%.[5]

University

The operating grant funding per fully funded student place was $12,150 in 1998[6].

The cost/benefit analysis assumes that this estimate provides a ballpark indication of underlying per capita university spending. This estimate was indexed to 2003 by growth in the Higher Education Cost Adjustment Factor (CAF) for the period 1998 to 2003 (10.5%).

In 2003 there were 719,555 domestic students and 498,985 Equivalent Full Time Student Units (EFTSU).

For the purposes of the cost/benefit analysis it is assumed that spending per domestic student in 2003 was ($12,150 x (1 + 10.5%) x 498,985 / 719,555 =) $9,307. This estimate is smaller than

[5] DEST advice 4 July 2005 drawing on Training Expenditure and Practices Survey (ABS 2002).

[6] *Setting Firm Foundations: Financing Australian Higher Education* (Paper prepared for the Government Review, "Higher Education at the Crossroads"), Page17.

for fully funded student places because it is a broader concept based on student numbers, rather than EFTSU.

For the cost/benefit analysis, it is estimated the Commonwealth Government : State and Territory Government : Private share of university spending to be 59% : 2% : 39% based on the proportions of revenue received by universities in 2003[7].

Workforce

On average, younger people tend to earn lower wages than mature workers. Hence the costs of changes in the timing of young peoples' entry into the workforce should be discounted for this fact. The following discount ratios (lines A and B in Table C.18) have been assumed.

Table C.18 Youth Wage Relativities

	Full-time employees	*Part-time employees*
	Mean weekly earnings	
Aged 15-19	$388	$122
Aged 20-24	$612	$278
All workers	$848	$323
A. Ratio 15-19 / All workers	0.46	0.38
B. Ratio 20-24 / All workers	0.72	0.86

Source: Employee Earnings Benefits, Trade Union Membership, ABS 6310.0, (August 2001) Table 4

To illustrate, a 5 year old entering the first year of universal schooling in 2010 would be 16 years old in 2021. The 'opportunity cost' of their staying at school rather than finding full-time employment is assumed to be 0.46 times the full-time mean weekly earnings for all workers in 2021. By the time this individual is 20 years old in 2026, the opportunity cost is 0.72 times full-time weekly earnings. Finally, by the time the individual is 25 years old in 2031 their opportunity cost is the same as for all workers on average. Inevitably, this calculation is 'broad-brush'.

As discussed above, the probability of (full-time and part-time) employment is benchmarked on actual data for each year of age (from 15 to 24) as at June 2003. The probability of employment as the impact cohort ages from 25 to 65 is based on broad averages that are believed to be consistent with the IGR. The IGR assumed age specific participation rates by 5 year cohorts – the IGR methodology has not been incorporated at this level of detail.

[7] *Finance 2003 – Financial Reports of Higher Education Providers.*

Appendix D: Cost/Benefit Analysis - Why GDP per Head is a Strong and Practical Predictor of Social Well Being

People from prosperous nations have more access to more goods and services. While prosperity does not guarantee happiness, it does offer one less excuse for being unhappy. Prosperity allows more people to drop out of the material 'rat race' should they wish, without falling into extreme poverty: a choice not available to those on the 'bread line' in low GDP per head economies. Prosperity is a good predictor of life expectancy. People living in rich, advanced economies live longer. World class nutrition and health care comes at a price.

Prosperity provides the means for a cleaner local environment. Rich people are more willing and able to bear the cost of anti-pollution measures, for example. Australia's big cities have cleaner beaches, waterways and air than many smaller cities in poorer countries. Increasingly, economic growth and new jobs are geared towards 'clean' industries. Although economic activity and car numbers have grown, air quality is considered to have generally improved.[8] Technology and strategies designed to control air pollution have countered the rises which would have been expected given the increases in pollution sources.[9] Water quality and soil degradation are issues receiving national priority currently – partly as we now have the prosperity to afford to 'buy' long term solutions in these areas.

GDP per head is a good predictor of where people would like to live if they were allowed to 'vote with their feet'. That is why international migration flows are predominantly from poor countries to rich countries and not the other way around. Prosperity and fairness are correlated, with higher income nations typically seeing a more even sharing of national income than poorer nations[10].

It is worth noting that net measures of domestic income per head (which take out the effects of capital depreciation and distinguish between output and income) are theoretically preferable to GDP per head or other 'gross' measures[11]. The preferred ABS 'headline' measure of material prosperity is 'net national disposable income'[12]. However, in practice, such measures do not provide significantly different conclusions to the GDP per head measure.

Some indicators of broader human progress are available[13] but, as noted above, they are highly correlated with GDP per head. Or as the ABS notes, "Australia's national income provides the basis for many other dimensions of progress"[14].

So prosperity (as measured by GDP per head) has its benefits. It provides choices otherwise not available. We do not know what choices future generations of Australians will make. But we can be confident that they would be happier to have more choices than fewer, and to be living in an economy that is richer than one which is poorer.

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[8] At least during the 1990s for which it was measured. See State of the Environment Advisory Council (SEC) 2002, *Australia – State of the Environment Report 2001*, SEC, CSIRO Publishing, Melbourne.

[9] Australian Bureau of Statistics 2001, Australia's Environment: Issue and Trends, Cat. no. 4613.0, ABS Canberra.

[10] See the United Nations' *Human Development Report*, 2004. In brief, the Gini coefficients (a measure of inequality) are lower for high income nations than low income nations – see Table 14 at pages 188-191.

[11] Such as Gross National Income (GNI) which is a refinement on GDP and is used in *World Development Indicators* which is published by the World Bank.

[12] ABS cat. 1370.0, 2002.

[13] Perhaps the best known measure is the UN's *Human Development Index* which combines in one index: (i) GDP per head, (ii) literacy and education enrolment rates and (iii) life expectancy.

[14] p39, ABS Cat. 1370.0, 2002.

Appendix E: Cost/Benefit Analysis - Education and Economic Potential

Three factors determine a nation's economic potential:

- First is the quantity and quality of natural endowments such as mining, farming, fishing and forestry resources.
- Second is the quantity and quality of physical capital such as buildings, infrastructure, machinery and software.
- Third, and most important, is the quantity and, especially quality, of the labour force.

The quality of the labour force is determined by competencies and skills of the workforce.

As Alan Greenspan recently noted:

> *"Over the past half-century, the increase in the value of raw materials has accounted for only a fraction of the overall growth of US gross domestic product. The rest of that growth reflects the embodiment of ideas in products and services that consumers value. This shift of emphasis from physical material to ideas as the core of value creation appears to have accelerated in recent decades. Ideas are at the centre of productivity growth."*

Higher levels of education provide an economic payoff for the nation and for individuals. For the economy as a whole more education means more skilled workers, which means:

- Higher productivity. Workers with more education bring a higher level of skills to the workplace.
- Higher participation. Workers with higher skill levels are more likely to work, and also tend to work for longer by choosing to delay retirement.
- Higher employment. Workers with more education are more employable and enjoy lower unemployment rates.

There is a clear and well-established relationship between education levels and levels of productivity. Recently, economists have also begun to emphasise the second and almost as well-established linkage – those with higher levels of education also have higher rates of workforce participation: both during working age and as they approach traditional retirement age.

For society, higher levels of education also mean higher average incomes. That in turn means even faster growth in tax collections because of our progressive income tax system (which applies higher average tax rates to higher earnings).

Those increased taxes may be spent for the benefit of everyone.

These increased tax collections – which can then be redistributed to everyone by the government – are perhaps the most direct economic channel by which society benefits from having a more educated workforce.

The direct effect of education on productivity

So education is increasingly becoming the 'engine room' of modern economies. If we get this part of the economy right, most other things ought to fall into place, because increased investment in education boosts both productivity and participation.

Education has a direct effect on the level of productivity in the economy (and therefore output growth) because it increases the productivity of individuals. A more educated worker is a more productive worker, and investment in education provides a pool of more skilled labour.

Individuals benefit from investing in higher skills because they can command higher earnings in the labour market place.

Figure E.1 Education delivers higher pay

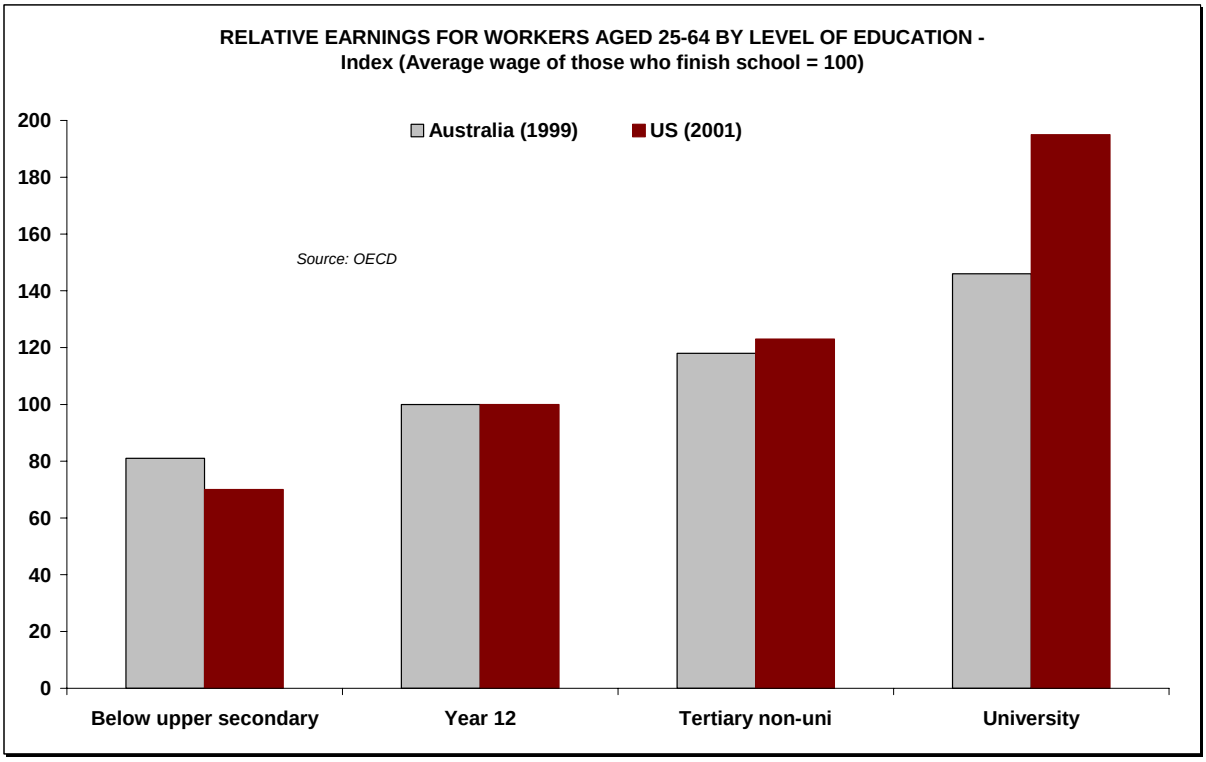


Figure compares the relative earnings of workers with different levels of education.

- The index is compiled on the basis that those who completed year 12 are assumed to have an average wage of 100.
- Lesser skilled workers have relatively lower average wages. In Australia (in 1999), those who had not completed Year 12 earned almost 20% less than those who had. For the US, the pay cut was even greater at 30%.
- Higher skilled workers have relatively higher average wages. For Australia, university educated workers earned 40% more than those who completed Year 12, and 75% more than the least educated.

Note that the US experience suggests a greater spread of wages there than in Australia. In the US, the least educated earn relatively less, and the most educated earn relatively more. The possible reasons for this difference are complex. But it is possible that the US experience could provide a pointer to future trends in Australia as international competition for skilled labour will likely become more intense over time: placing pressure on Australia's relatively compressed skill differentials.

Research has attempted to measure the effect of education on productivity in two broad ways.

The first looks at relative wages across skill levels, and attempts to estimate the 'private return to education', the increased wages received by workers who have undertaken an additional year of schooling. Figure provides evidence of the strength of the results.

- Aschenfelter and Krueger (1993) undertook a study of wage data for a sample of twins in the US. They found that an additional year of schooling resulted in increased wages of between 12% and 16%.

- An Australian study (Miller, Mulvey and Martin (1995), using similar twins data collected in the 1980s) found a wage increment from an additional year of schooling of around 7.5%. This study ignores the effects of schooling on wages within occupations, instead focusing on the effect of education on wages through the impact on the occupation of the individual.

The second method of estimating the return to schooling looks at levels of education and income across countries. As with all cross-country studies, the strength of any conclusions is limited by the availability of comparable data. However, research by Bassanini and Scarpetta of the OECD indicates that an extra year of schooling eventually raises GDP by around 6%.

This approach has not (as yet) incorporated the further refinement of adjusting for cross-country differences in schooling quality. Note that this figure combines the productivity and participation channels of higher education levels.

The effect of education on productivity growth

In addition to the case above, some researchers argue that a more skilled workforce is more able to adapt to new technologies in the workplace. This argument puts forth the idea that not only does education increase the *level* of productivity in the economy, it also has an effect on the *growth* of productivity over time[15].

Research into this 'catch up' phenomenon has produced some interesting results by comparing countries over time, but is yet to produce solid evidence for developed countries.

It is perhaps too early to tell whether productivity growth is improved over and above the direct increase in worker productivity, but to the extent that there are positive 'spill overs' from education, there is potential for an increase in broad productivity growth.

The modelling here has therefore allowed for a linkage between education levels and productivity levels, but *not* between education levels and productivity growth.

The effect of education on participation rates

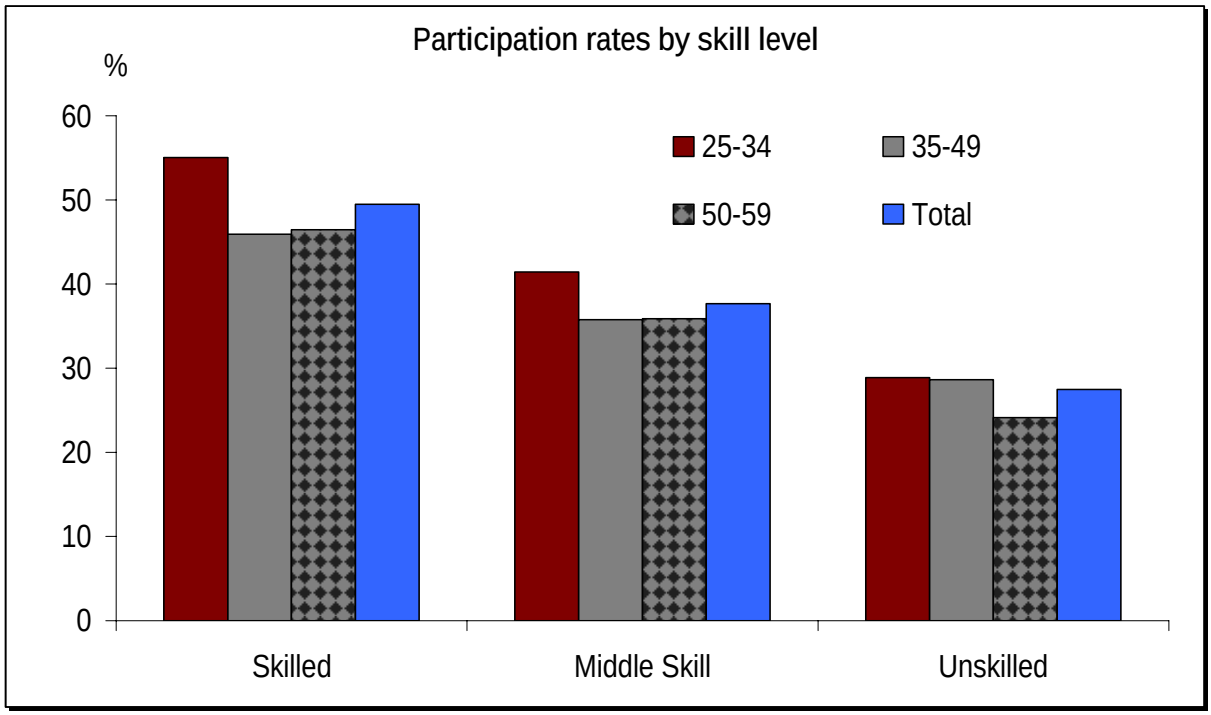
Higher education increases the wage an individual can command, giving them a stronger incentive to work, and reduces their likelihood of any spells in unemployment.

To the extent that higher skilled jobs tend to be less 'back breaking' and more interesting, it also means that older higher skilled workers are more likely to be willing and able to maintain a connection with the workforce than less skilled workers.

While detailed data on the effects of a small increase in education on the length of working life are not available, there is ample evidence that increased educational attainment results in increased labour force participation. This is shown in Figure E2.

[15] This is a strand of the literature on 'endogenous growth' economic models which attempts to identify the forces underlying multifactor productivity growth rather than applying the traditional assumption of an 'exogenous' parameter.

Figure D.2 Participation rises with skill levels



*Where 'Skilled' represents a bachelor degree or higher, and unskilled no qualification

The effect of education on unemployment

Higher rates of education also reduce the likelihood of unemployment because the unemployment rate declines as education levels rise – see Figure E.3.

Economic growth inevitably involves a degree of disruptive change. Capital and labour are made redundant in some industries at the same time that other industries are experiencing capital and labour shortages.

Higher levels of education allow displaced workers to more easily pick up the threads of their career. Less educated workers have greater difficulty in demonstrating the skills that would allow them to quickly find another job.

In Australia, the chances of being unemployed are three times greater for those who have not completed Year 12 compared to those who have completed a university degree.

Figure E.3 Education delivers jobs

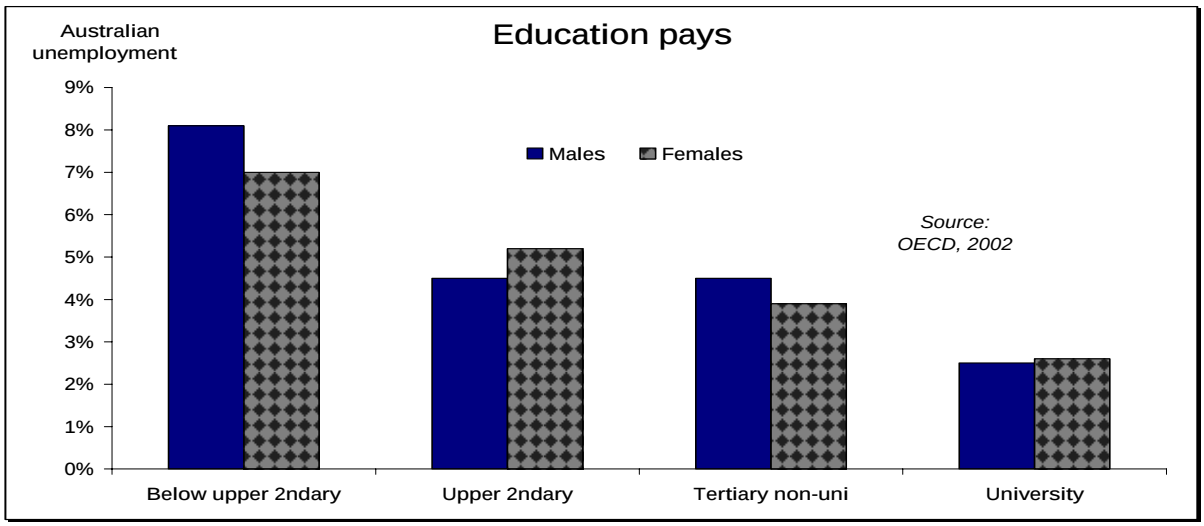
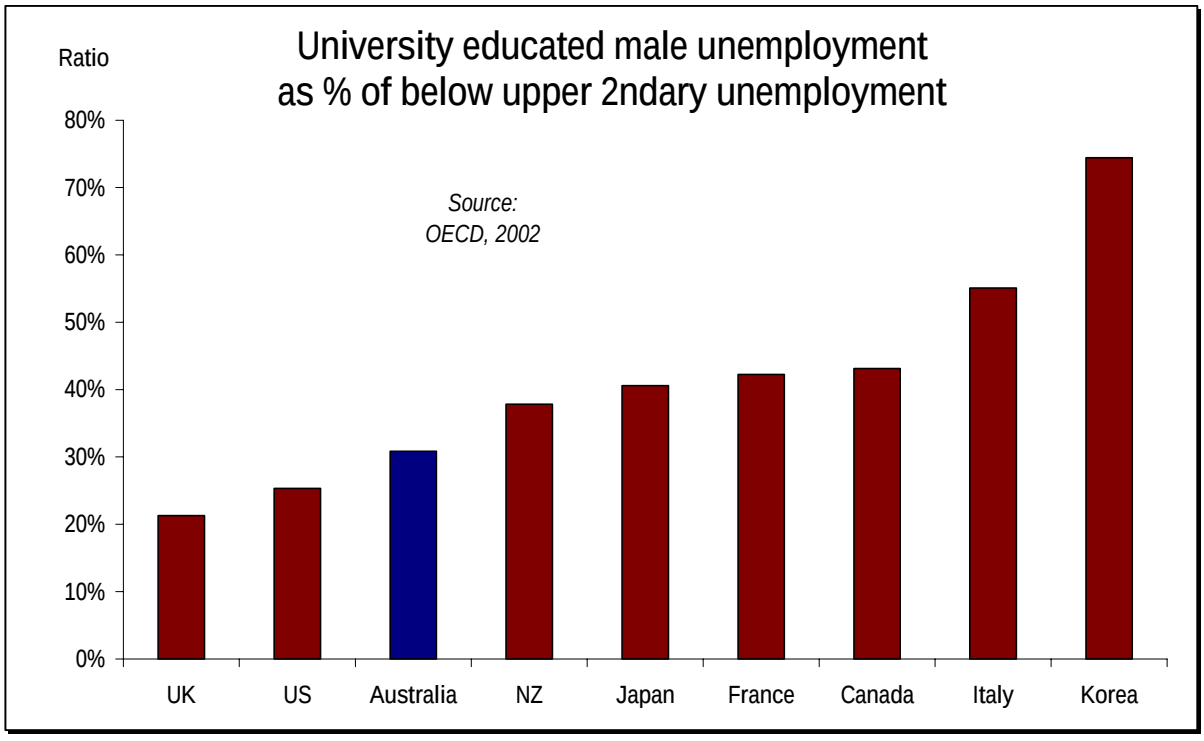


Figure E.4 shows that Australia's experience with the higher employability of higher skilled workers is broadly reflected in international experience. In the US, the chances of being unemployed are more than four times greater for those not completing the equivalent of Year 12.

Figure E.4 International comparison of education-employment link



Appendix F: How the South Australian system was modelled

The South Australian system, with 'rolling enrolments', provided unique analytical challenges for the Project. Substantial cooperative effort between South Australia Department of Education and Children's Services, Access Economics and Atelier Learning Solutions resulted in three different methods of modelling the outcome against each option. The conclusions reached through the three methodologies coincided. As a consequence, the method used by Access Economics was incorporated into the cost/benefit analysis model. It is described below.

The Access Economics model for South Australia

There are four intakes into Reception, corresponding to the beginning of each school term. For example, most recently, these intakes were at 31 January, 2 May, 25 July and 17 October.

The intake of 31 January includes some students from the previous year's Reception Year intake of 25 July and 17 October (discussed later). The share of the new intake is calculated on the assumption that children's birthdays are uniformly distributed over the course of a year. As 29% of the days in a year lie between 18 October to 31 January, it is assumed that 29% of the new intake will arrive on 31 January, 25% on 2 May and so on (column B in Table).

With an expected 5 year old cohort of 17,071 in 2010, the number of children in Reception Year – consistent with the assumptions about the number of children completing a second year of Reception discussed below – is 22,905. Of these, 5,835 are students from the previous year's intake – which amounts to 30% of the Prep Year and 43% of the 5 year old cohort (bottom Column A).

Children must be at least 5 on or before each intake date (column D). Working backwards, it is possible to calculate the ages of those children at the end of the prior year. For example, the youngest age at which a child may enter Reception is one who turns 5 on 17 October. Such a child would have been 4 years and 2 ½ months old at the end of December of the year prior (or 4.21 decimal years). Included in the 17 October intake are all children born prior to 17 October but after 25 July (otherwise they would have been eligible for the 25 July intake). As there are 84 days between 25 July and 17 October, assuming an equal distribution of birthdays over this period, the average age of children in the 17 October intake is equal to 4.21 (from Column E) plus (84/2)/365 = 4.32 decimal years. Similar calculations were undertaken for each of the intakes.

Note the initial assumption is that children enter the Reception Year at the first opportunity – that is equivalent to 100% 'prompt starters'. However, this assumption was modified to take account of the national estimate of 3.98%per month prior to the minimum school starting age.

While at present there is no indication of a later starter effect in the South Australian data, nor is there any indication of what might happen if parents are given a start of year option. As with other jurisdictions, where a start of year option allows delay and later placement into the year before Year 1, (as opposed to placement into Year 1 if delayed), it is likely that many parents of younger children will delay entry of their children to school for one year. The only data available is that of New South Wales where the rate of delay is 3.98% per month. Therefore this rate has been extrapolated throughout the model for all states with similar procedures.

On the basis of the 3.98% per month late starter assumption, the average age of children in the Reception Year at December 31 of the year previous is (weighted sum of Column C x Column F=) 4.93 years.

Similar calculations are undertaken for each of the four intakes and are presented in Table F.1 below.

Table F.1 South Australian intake into Reception

Four intakes:	Rolling Intake of new students (A)	Share of new intake (B)	Share of R with repeaters (C)	Minimum age of new entrants at time of entry (decimal) (D)	Minimum age of new entrants (decimal) 1 Dec year prio (E)	Weighted age Reception Year (decimal) 1 Dec year prio (F)
31 January repeaters from prior year (T3)	3,457		14%			5.55
31 January repeaters from prior year (T4)	3,929		16%			5.32
31 January	4,958	29%	20%	5.00	4.92	5.06
2 May	4,256	25%	17%	5.00	4.67	4.79
25 July	3,929	23%	16%	5.00	4.44	4.55
17 October	3,929	23%	16%	5.00	4.21	4.32
Prep year	24,457					
5yo cohort (2010)	17,071	100%	100%			
Repeaters proportion of Reception year	30%					
Repeaters proportion of 5yo cohort	43%					
Average age at 31 December in prior year					4.58	4.93

Each of the intakes is assumed to have a different graduation ratio into Year 1 as described by Table F.2.

- All of the children in Reception who were in Reception the previous year plus those new starters in the 31 January and 2 May intakes are assumed to graduate to Year 1.
- 12% of the 25 July intake children are assumed to graduate to Year 1. (Specifically, 23% of the May birthdays, 7% of the June birthdays and 5% of the July birthdays, that is ((23%+7%+5%)/3=) 12% of the July intake are assumed to graduate.)
- None of the 17 October intake is assumed to graduate to Year 1.
- Multiplying these graduation ratios by Column A in Table gives the estimates of graduates and those doing Reception again by intake.
- The last column in Table F.2 shows the components of Reception Year who will graduate to Year 1. The average age of this group (at December 31 of year previous) is 5.05 years.

Table F.2 Average age of Reception year with those doing Reception again removed

Four intakes:	Graduation ratios to Year	Graduates into Year 1	"Repeaters"	Share of Reception No repeaters	Share of Recepti No repeaters (scaled)
31 January repeaters from prior year (T3)	100%	3,457	-	14%	20%
31 January repeaters from prior year (T4)	100%	3,929	-	16%	23%
31 January	100%	4,958	-	20%	29%
2 May	100%	4,256	-	17%	25%
25 July	12%	471	3,457	2%	3%
17 October	0%	-	3,929	0%	0%
Recption year		17,071	7,386	70%	100%
Average age at 31 December					5.14

The first two lines of Table F.3 summarise the conclusions thus far:

- The average of South Australian Reception Year at 31 December of year previous – assuming 3.98% per month late starters – is 4.94 years.
- Once those doing Reception again have been removed, the average age rises to 5.14 years.

The next three lines of Table F.3 indicate the average age of Reception Year under each of the 4 years and 5 months, 4 years and 6 months and 4 years and 8 months options (again assuming 100% prompt starters). Given the current South Australia system, a move to the 4 years and 6 months option with an average age of 5.00 years or the 4 years and 8 months option with an average age or 5.17 years would leave the 'normal' cohort with virtually the same average age as at present (after the repeat factor is isolated).

Table F.3 Average Reception year ages as currently estimated and as estimated under the scenarios

	Average age assuming 4% per month late starters				
	Decimal years	Years	Months	Minimum age scenario	
Average age Reception Year (31 Dec)	4.93	4	11.1		
Average age Reception Year (31 Dec) no repeats	5.14	5	1.7	Years	Months
Average age Reception Year (4.5 scenario 31 Dec)	4.92	4	11	**4**	**5**
Average age Reception Year (4.6 scenario 31 Dec)	5.00	5	0	**4**	**6**
Average age Reception Year (4.8 scenario 31 Dec)	5.17	5	2	**4**	**8**

Three other factors need to be taken into account before settling on the final cohort impacts for South Australia.

First, there is the permanent elimination of the 'repeat' factor (doing Reception again in the following year) from South Australian Reception year, which as discussed above, is equal to 30% of the current Reception cohort and 43% of the 'normal' cohort. This represents a permanent saving for the South Australian primary school sector.

Second, a (separate) 'bubble' impact (changed size of the introductory cohort) would occur for the introductory cohort in 2010 and would continue while that cohort was at school. The 'bubble' impact (Column A in Table F.4) is calculated as the gap between the effective average age of the current system (5.05 years) and the average starting age in Reception Year under each of the options.

The bubble impact is then multiplied by the prompt starter assumption to give an adjusted bubble impact (Column C). The adjusted bubble impact works its way through the SA primary school system, then the secondary school system, tertiary education and the workforce.

For the first eight years after the changes, the permanent 'no repeater' effect and the bubble effect overlap in their impact on the primary school sector (last column of F.4).

In Table F.4, as explained above, the age of 4 years and 11 months represents the 4 years and 5 months option, 5 years 0 months represents the 4 years and 6 months option and 5 years 2 months represents the 4 years and 8 months option. The combined cohort effect is shown at Table F.4 below.

Table F.4 Adjusted bubble and 'no repeater' impacts under each of the scenarios

Bubble in moving to each proposal			Bubble (%)	Prompt starter assumption	Adjusted bubble	Repeater	Combined effect
Years	Months	Decimal	(A)	(B)	(C) = (A) x (B)	(D)	(C) + (D)
4	11	4.92	22.42%	48.00%	10.76%	-43.27%	-32.50%
5	0	5.00	14.09%	52.00%	7.33%	-43.27%	-35.94%
5	2	5.17	-2.58%	60.00%	-1.55%	-43.27%	-44.81%
4.5 average is 4.5 + 6 months = 4 years 11 months				4 % effect			
4.6 average is 5 years							
4.8 average is 5 years 2 months							

The third factor to be taken into account is the present pattern of resourcing rolling enrolments. At present, schools are staffed at the beginning of each year on the basis of anticipated Term 2 enrolments. This means that for each child enrolling at the commencement of Terms 1 and 2, including those doing a second year of Reception, there is a full year State Government and parent fee resource allocation.

However, for each child enrolling in Term 3 there is a 6 month State Government and parent fee resource allocation and for each child enrolling in Term 4 there is a 3 month State Government and parent fee resource allocation. Thus, Term 3 enrolments are divided by 2 for State government and parental fee calculations and Term 4 enrolments are divided by 4.

To further complicate the model and the calculations, the Australian Government provides grants on the basis of the August census (July enrolments). Because Term 4 enrolments are not in the schools at the time of the census, they are not counted for Australian Government funding purposes. They thus have to be discounted from calculations of Australian Government grants.

Moreover, the Australian Government does not provide funds for those children in the Term 3 enrolments who are not going on to Year 1 in the following year. Thus, the Australian Government provides funding for only 12 per cent of Term 3 enrolments. Funding is provided at an FTE rate for each of these children.

The combined effect produces the permanent costs/benefit effect on the South Australian sector. However, it is the actual cohort effect that is relevant to the prior-to-school sector in the State. The more negative the cohort effect, the more resources have to be channelled into private long day care, community based long day care or family day care.

Kindergarten enrolments are not thought to be permanently affected by any of the options. This is expected to be the case for the year before Year 1 in all jurisdictions. Kindergarten enrolment is bounded by an age range from a minimum starting age. It represents the cohort one year younger than the Reception cohort. Therefore, if the Reception cohort is 'normal' from 2010, the kindergarten cohort will be 'normal' from that time.

Management options proposed in the State chapter would allow South Australia to manage its kindergarten cohort without an increase in 2009. Should other options be implemented, there may be a 'bubble' in kindergarten in 2009, equivalent in size to the size of the anticipated Reception bubble for the 4 years and 5 months option and 4 years and 6 months option in 2010. However, in the model, there is an assumption that kindergarten can be managed without cost in 2009.

Appendix G: How the 'late starter' effect was modelled

Other than in Tasmania, there is a gap between the minimum school starting age and the maximum school starting age. This gap allows parents of children born in the first half of the year some discretion as to when their child enters universal schooling. It is possible to estimate the degree to which parents delay entry of their children by comparing population census with school census data. This is best illustrated with an example – say Victoria.

The Victorian example

1. Victoria's minimum school starting age suggests an eligible minimum cohort aged 4 years and 8 months through to 5 years and 8 months (less one day) at 31 December in the year prior to Prep.

2. This eligible cohort would therefore be aged 5 years 2 months (plus one day) through to 6 years and 2 months on 1 July in their Prep year school census.

3. This minimum age cohort 'maps' to ABS population series (at 30 June which is assumed to be unchanged from the 1 August school census birth date of 1 July) as equal to 10/12 of the 5 year old cohort and 2/12 of the 6 year old cohort.

4. When we multiply the ABS population series by these fractions we get a prediction of the age distribution of Victorian Prep year children. In particular: ABS Victorian 6 year olds at 1 July 2003 = 64,118 x 2/12 = 10,686 predicted number of prompt starters in Prep.

5. This prediction can be compared with actual (school census) numbers. At July 1, 2003, the number of Victorian 6 year olds in Prep was 21,310.

6. This is evidence of a late starter effect of 17% in Victoria, calculated as follows:

- Predicted proportion of 6 year olds in Prep = 2/12 = 17% = D
- Actual proportion of 6 years olds in Prep = 33% = C
- Gap = D - C = -16% (after rounding)

7. A 'late starter' effect of 17% is equivalent to a 'prompt starter' factor of (100% - 16% =) 84%.

8. The 'prompt starter' factor is further reduced for the 'NSW effect' discussed below. The 'prompt starter' factor reduces the size of the cohort bubble, thereby reducing the impact of the proposed changes.

Similar calculations for the other jurisdictions are shown in Table G.1.

Table G.1 Estimates of 'prompt starter factor'

	Number of of 6 year olds in 'Prep' (July 2003)	Population of 6 year olds (June 2003)	Share of 6 year c population in 'Prep'	Expected share of 6 year olds in in 'Prep'	Prompt starter factor
	(A)	(B)	(C) = (A) / (B)	(D)	1- ((C) - (D))
NSW	17,430	88,839	20%	0	80%
VIC	21,310	64,118	33%	=2/12	83%
QLD	55	52,381	0%	? (in transition)	?
SA	3,023	18,918	16%	?	?
WA	603	26,153	2%	0	98%
TAS	2,963	6,311	47%	=6/12	103%*
NT	491	3,292	15%	0	85%
ACT	1,023	4,278	24%	=2/12	93%
Results.xls	* shouldn't be more than 100%. Result due to survey differences.				

The 'New South Wales factor'

In New South Wales, which has the youngest school starting age in the country, it is also possible to estimate the proportion of late starters/prompt starters amongst *4 year olds*. The NSW estimates suggest that the late starter effect is much stronger amongst the younger age group. There is some corroborating evidence for this from Victoria's experience in moving from a '4 years 6 months' regime to a '4 years 8 months' regime. If this feature were to be present in other jurisdictions, it would significantly reduce the size of the impact on the introductory cohort resulting from the options. The New South Wales factor works out at a rate of 4% per month from the minimum school starting age.

This 'New South Wales factor' has been applied in the model to all jurisdictions except Western Australia and Queensland.

In the State chapter for Tasmania, the 'New South Wales factor' has been applied along with a model that deletes the factor. In Tasmania, the pre-2004 data suggest that, at a time when the minimum school starting age did not coincide with the compulsory age, there was little delay in school entry. However, the minimum school starting age was effectively 5 year of age and there is little delay of 5 year olds in any system. What is not known is the potential impact of delay on children between 5 years of age and 4 years and 8 months, 4 years and 6 months, or 4 years and 5 months at the start of the school year. Data from elsewhere, such as Victoria and New South Wales, indicate that delay is likely to occur, and at an increasing rate the younger the child. The New South Wales factor is therefore used in the nationally comparable model for Tasmania, while in the State chapter the outcomes without the delay factor are also modelled.

In the state chapter for South Australia, the 'New South Wales factor' has also been applied. At present, parents have no need to delay with the school sector taking children in as they turn 5 years of age and providing a second year in Reception for most young children who enter school in the second half of the year. With a start of year intake, it is possible that all of these children who do a second year in Reception could have their school entry delayed until the following year. On the other hand, those born before the minimum school starting age could enter school at the commencement of that year and go to Year 1 at the end of the Reception year. The extent of potential delay is currently unknown. However, from 2010, the procedures in South Australia would most likely be akin to those in all other states and territories other than Western Australia and Queensland. Therefore, the New South Wales factor is used in the model to represent delay for South Australia.

The 'Western Australia and Queensland exceptions'

The methodology associated with delay does not apply in the case of Queensland, which is introducing a non-compulsory Preparatory year from 2007. Nor does it apply to Western Australia, which has recently implemented a universally available full time Pre-Primary year to provide 13 years of school education.

In transitioning from 12 years to 13 years of universal education, these states operate a different practice around delay in relation to school entry. Whereas other states place children whose entry to school has been delayed one year into the first year of school (the year before Year 1), the policy in Western Australia and Queensland is to place children within a relatively narrow age cohort. In most cases, this means children are placed into Year 1 upon their late entry to school. In effect, this means that these children are provided with 12 years of school education rather than 13 years. Queensland is in the process of considering this practice as the basis for legislation, making Year 1 the first compulsory year, rather than an age.

Perhaps parental reaction to this approach is the reason for very little delay in the Western Australia schooling system. Queensland's advice is that a similar amount of delay would be expected once Prep is introduced from 2007. Data from the Prep trial and present phase in period indicate no delay of any significance. Thus, in the nationally comparable model, the New South Wales delay factor has been included in Queensland and Western Australia.

Modelling assumptions

Table G.2 shows the prompt starter assumptions that were used in the modelling.

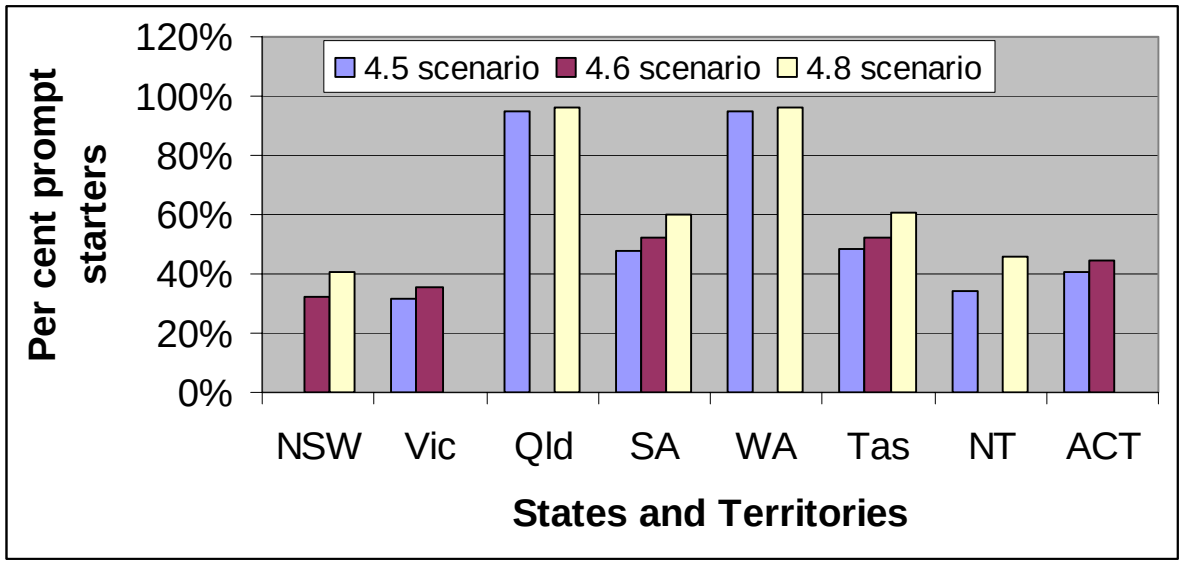
Table G.2 Prompt starter assumptions used in the modelling

Prompt starter assumption used in model (=100% - 'late starter' assumption) used in model	NSW	Vic	Qld	SA	WA	Tas	NT	ACT
4.5 scenario		32%	95%	48%	95%	49%	34%	41%
4.6 scenario	33%	36%		52%		52%		45%
4.8 scenario	41%		96%	60%	96%	60%	46%	

For NSW, Victoria, Northern Territory, Australian Capital Territory and Tasmania, it was assumed that the proportion of prompt starters declined at the same rate as suggested by the NSW data, that is, by 51% over the 13 months from 4 years 11 months to 6 years which is equivalent to (51%/13=) 4% per month shy of 6 years of age. Similar assumptions were made for South Australia. In the case of Queensland, it was assumed that the proportion of late starters was the same as for Western Australia.

Figure G.1 shows these same numbers in graphic form, along with estimates of prompt starters where they are known.

Figure G.1 Prompt starter proportions given New South Wales "slope" on differing cohorts



Note that the prompt starter assumptions are based on actual data for 5 and 6 year olds in each jurisdiction and in all cases, other than for Western Australia and Queensland, also include the reciprocal of the New South Wales late starter assumption for 4 year olds. The height of the bars for Queensland and Western Australia is explained by the deletion of the New South Wales late starter effect.

Overall, and within the data and information available, this approach has been accepted across the states and territories as the most reasonable (and cost-effective) way of handling late starting impacts. On the whole, the approach reduces quite considerably the costs and benefits of the introduction of any of the options for a common minimum school starting age when compared with the limited delay approach proven by the available data in each jurisdiction.

Appendix H: Glossary

Australian Government Census of Child Care Services. This is compiled by the Department of Family and Community Services and provides the most comprehensive data available on Australian Government funded child care. The most recently published census is for May 2002.

Community based long day care. This is provided in a centre mainly for non-school children on a not-for-profit basis. Centres may be located in residential areas, close to work places or on major transport routes. Care is mainly work-related and is provided on a regular full-time or part-time basis. Centres are generally open for at least 8 hours per day, 5 days per week, 48 weeks of the year.

Cost-benefit analysis. This is a method for organising information to aide decisions about the allocation of resources. Its power as an analytical tool rests in two main features: (i) costs and benefits are each as far as possible expressed in money terms and hence are directly comparable with one another; and (ii) costs and benefits are valued in terms of other claims they make on and the gains they provide to the economy as a whole, so the perspective is a 'global' one rather than that of any particular individual, organisation or group.

Family day care. This is provided by a network of experienced caregivers who provide care and developmental activities in their own homes for other people's young children.

Full-time work. Is defined by the Australian Bureau of Statistics as 35 hours per week (or more) from all jobs.

Informal care. Non-regulated care, arranged by a child's parent/guardian, either in the child's home or elsewhere. It comprises care by (step) brothers or sisters, care by grandparents, care by other relatives (including a parent living elsewhere) and care by other unrelated) people such as friends, neighbours, nannies or baby sitters. It may be paid or unpaid.

Labour force. For any group, persons who were either employed or unemployed, as defined.

National Schools Statistics Collection (NSSC). The NSSC is a collaborative arrangement between state, territory and Commonwealth education authorities and the Australian Bureau of Statistics (ABS). The NSSC uses a set of concepts, definitions and classifications developed jointly by these agencies. It forms the basis of the ABS Schools publication, ABS cat. 4221.0.

Occasional care service. Provides care mainly for non-school children. These services cater mainly for the needs of families who require short term care for their children.

Outside School Hours Care service. Outside school hours care services provide care for school aged children before and/or after school during the school term. Some services also provide care on 'pupil free' days.

Participation rate. For any group, the labour force expressed as a percentage of the civilian population. If age group is not mentioned then by assumption the reference age group is 15 years and over.

Part-time work. Is defined by the Australian Bureau of Statistics as less than 35 hours per week from all jobs.

Present value. Costs and benefits should be valued at the specific time that they occur. since a dollar's consumption in the future is usually worth less than a dollar's consumption today, future costs and benefits are discounted to a 'present value' with the use of a 'discount rate'.

Private long day care. This is provided in a centre mainly for non-school children on a for-profit basis. Centres may be located in residential areas, close to work places or on major transport

routes. Care is mainly work-related, and is provided on a regular full-time or part-time basis. Centres are open for at least 8 hours per day, 5 days per week, 48 weeks of the year.

Unemployed. Persons aged 15 years and over who were not employed (at the time the survey was undertaken) , and (i) had actively looked for full-time or part-time work in the four weeks prior to them being surveyed or (ii) were waiting to start a new job within four weeks of being surveyed but would have been ready to start work immediately had their new job allowed them to.

Vacation care service. Vacation care services provide care for school children during the school holidays.

Appendix I: References

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