January 2003

The Economy–Wide Benefits of Increasing the Proportion of Students Achieving Year 12 Equivalent Education

Modelling Results

A Report prepared for the Business Council of Australia by
The Allen Consulting Group

BUSINESS COUNCIL OF AUSTRALIA

The Allen Consulting Group

The Allen Consulting Group Pty Ltd

ACN 007 061 930

Sydney

3rd Floor, Fairfax House, 19 Pitt St

Sydney New South Wales 2000

Telephone: (61–2) 9247 2466

Facsimile: (61–2) 9247 2455

Melbourne

4th Floor, 128 Exhibition St

Melbourne Victoria 3000

Telephone: (61–3) 9654 3800

Facsimile: (61–3) 9654 6363

Canberra

Level 12, 15 London Circuit

Canberra ACT 2600

Telephone: (61–2) 6230 0185

Facsimile: (61–2) 6230 0149

Perth

Level 25, 44 St Georges Terrace

Perth WA 6000

Telephone: (61–8) 9221 9911

Facsimile: (61–8) 9221 9922

Online

Website: www.allenconsult.com.au

Table of Contents

1. Introduction

The Business Council of Australia (BCA) commissioned the Allen Consulting Group and the Centre of Policy Studies at Monash University to undertake an analysis of the economy–wide benefits of an increase in the proportion of Australian students achieving Year 12 equivalent education. This report provides a brief summary of the key results. The full modelling report provided by the Centre of Policy Studies is at Attachment A.

The background for this modelling work is contained in two reports. The first is *Young Persons' Education, Training and Employment Outcomes with Special Reference to Early School Leavers* which was prepared by Applied Economics for the BCA and the Dusseldorp Skills Forum (DSF) in October 2002. The second report titled *Realising Australia's Commitment to Young People* was prepared for the DSF by Applied Economics in November 2002. That report examined the impact of a program that would result in an increase from 80 to 90 per cent in the proportion of young people who achieve Year 12 equivalent education in the five–year cohort 2003 to 2007. The report concluded that the benefits of such a program would be significant—the net present value of the program was estimated to be around $8.2 billion with a discount rate of 5 per cent, or around $4.6 million discounted at 7 per cent.

The work undertaken by Applied Economics essentially examined the *direct* costs and benefits of a program that increased Year 12 equivalent education for the single 2003 to 2007 age cohort. This current modelling exercise By the Centre of Policy Studies at Monash University expands on this earlier work by:

- incorporating the *indirect* costs and benefits of a program to expand the proportion of students completing Year 12 equivalent education (for example, changes in employment and taxation revenue arising from the program); and
- modelling an on–going (rather than a one–off) program to increase the proportion of students completing Year 12 equivalent education—we believe this is a more realistic policy scenario than one in which the program ceases after five years.

The specification of the modelling task is outlined in Exhibit 1.

Exhibit 1

THE MODELLING TASK

The MONASH macroeconomic model was used to examine the impact of implementing a program ("the program") to increase the proportion of young people in Australia who achieve a Year 12 or equivalent education from 80 to 90 per cent. As reported by Applied Economics in *Young Persons' Education, Training and Employment Outcomes With Special Reference to Early School Leavers* (prepared for the BCA and DSF in October 2002), this increase represents 50 per cent of early school leavers.

The program consists of a government–funded increase in the provision of education and training, including apprenticeships and traineeships and transition programs. The modelling exercise assumes that the program is implemented in 2004 and continues until the end of the forecast period in 2050.

The costs associated with the program include the costs of extra school places; extra apprenticeships and traineeships; extra school books and uniforms; and lost earnings for ex–early school leavers during their extra school years. Benefits include increased earnings for ex–early school leavers once their extra school years are completed; improved social outcomes (e.g. reduced crime); and gains for employers (e.g. increased productivity and profitability).

The modelling exercise was required to determine the impact of the implementation of the program on key macroeconomic indicators such as GDP and the terms of trade. The net impact of the program on economic welfare over the forecast period was also examined.

2. Modelling Assumptions

The modelling was undertaken using the MONASH macroeconomic model (detail on the model is included in Attachment A). The key assumptions underlying the modelling are that:

- the direct costs and benefits of extra Year 12 equivalent education are as estimated by Applied Economics in *Realising Australia's Commitment to Young People*;
- as a result of the program, there is a fall in earnings for workers who have not participated in the program equal to 10 per cent of the extra earnings generated by the program—this is referred to as the 'displacement rate';
- Australia's population grows by 1 per cent per annum;
- wages grow annually by 1.3 per cent and long run annual employment grows by 1 per cent; and
- the ratio of public sector deficit to GDP remains unchanged by the policy—this means that taxes are adjusted in line with the government costs and benefits associated with the program. In the early years of the program taxes rise to fund the program, while in later years, taxes fall in response to increased economic activity.

3. Key Results

The key results of the modelling are that:

- ***the program will reduce GDP between 2004 and 2014 (relative to business-as–usual), but increase it in the longer run***—by 2020, GDP is estimated to be 0.28 per cent higher than would otherwise have been the case;
- ***the program will reduce real private consumption between 2004 and 2011 (relative to business-as–usual), but increase it in the longer run***—by 2020, consumption is estimated to be 0.18 per cent higher than would otherwise have been the case; and
- ***the program will have a positive long term impact on economic welfare***—using a discount rate of 5 per cent, the program will generate a stream of welfare benefits between 2004–2050 equivalent to a one–off increase in welfare in 2003 of around 2.5 per cent. In dollar terms, this equates to a one–off increase in consumption in 2003 of around $10.7 billion.

Macroeconomic modelling generally involves estimating the impact of a proposed policy by applying a series of 'policy shocks' to a business–as–usual forecast of future economic outcomes. Deviations from the business–as–usual forecast generated by the policy shocks then provide an indication of the impact of the policy on key macroeconomic indicators. In this case, the policy shocks applied to the MONASH model's business–as–usual forecasts (or 'base case') comprised the direct costs and benefits associated with the program in each year of the forecast period (2004–2050).

In interpreting the results of the MONASH model it is critical to note that all results are therefore shown *relative to outcomes under the base case (business–as–usual) projection.* Where, for example, the program is estimated to lead to an estimated decline of GDP of 0.6 per cent, this means that GDP is 0.6 per cent below the *level* it would have been under the business–as–usual case. It does not mean that the *rate of growth* is 0.6 per cent lower.

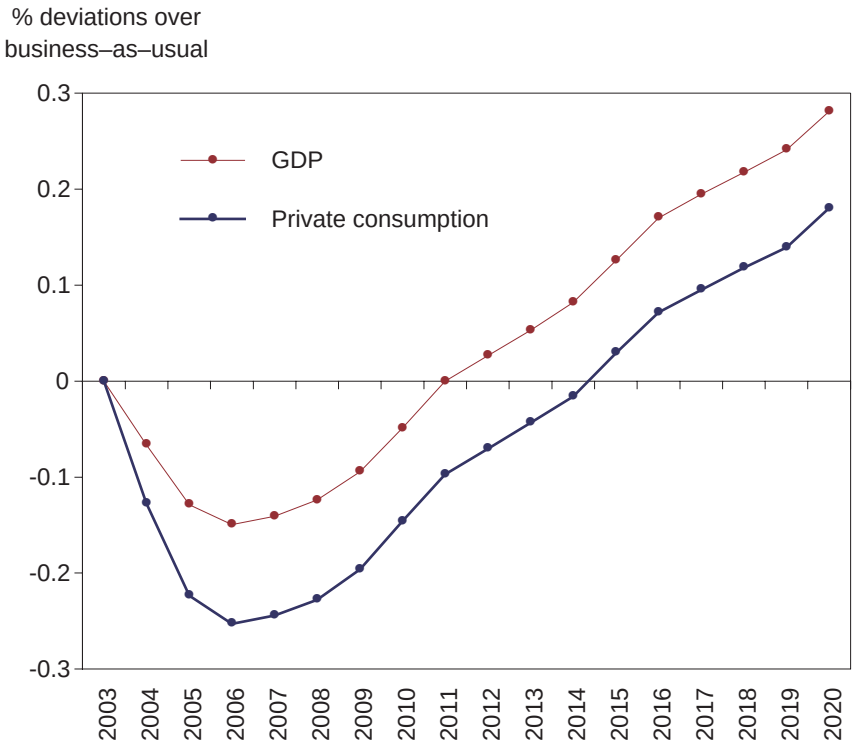
GDP

Initially, the program reduces GDP relative to business–as–usual (Exhibit 2). This is mainly due to the withdrawal of labour associated with the increased participation by young people in education. In the early years of the program, tax increases are also needed in order to fund the costs of delivering the additional education services required by program.

Over time however, the program acts to increase GDP relative to its business–as–usual level. These increases are largely due to an eventual increase in labour input to the economy, mainly reflecting increased efficiency and participation by program graduates. By 2020, GDP is 0.28 per cent greater than would have been the case in the absence of the program. An increase of 0.28 per cent in Australia's current GDP would be worth about $1.8 billion.

Exhibit 2

GDP AND CONSUMPTION 2004:2020



Source: MONASH modelling results

Real Private Consumption

In the short run, real private consumption is reduced below business–as–usual levels (Exhibit 2). As with GDP, this is due largely to the reduction in labour input, as well as tax increases generated by the program. However by 2020, the program has resulted in an increase in economic activity and a corresponding fall in taxation (in order to leave the public sector deficit to GDP ratio unchanged)—as a result, consumption is 0.18 per cent higher than would have been the case without the program. An increase of 0.18 per cent in Australia's current level of real private consumption would be worth about $720 million.

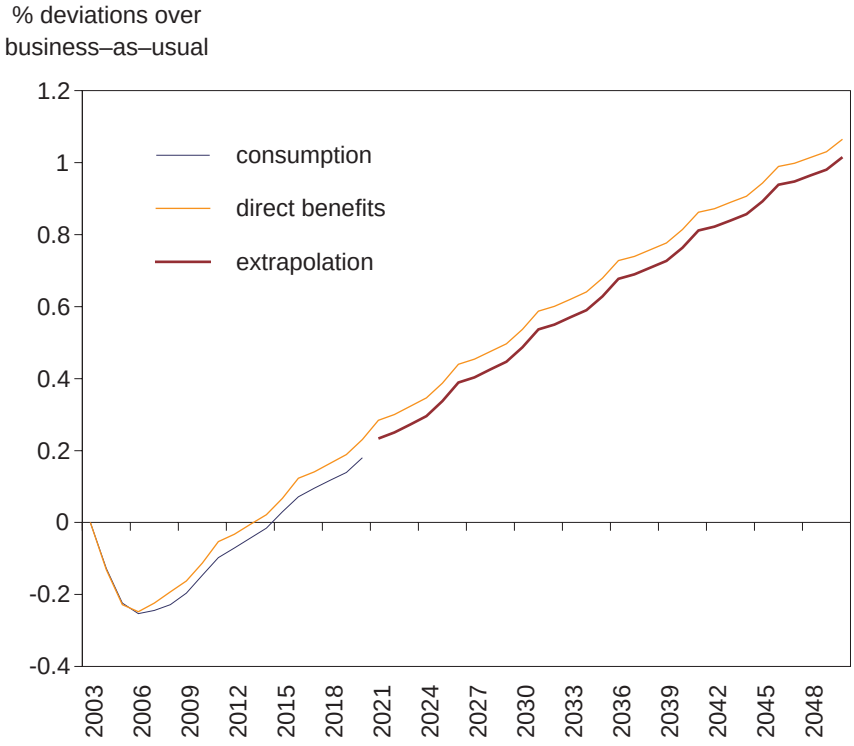
Welfare Benefits to 2050

For the purposes of analysing the welfare impacts of a program to increase the proportion of young people completing Year 12 equivalent education, changes in private consumption generated by the MONASH model provide a reasonable measure of the economy–wide welfare effects of the program. The long term welfare impacts of the program can therefore be identified using estimates of the impact of the program on real private consumption between 2004 and 2050.

In its current form, MONASH is only set up for modelling simulations out to the year 2020. However, given that the policy under examination in this report clearly has benefits beyond this time, it is helpful to attempt to generate an estimate of the longer term impacts of the program from the existing modelling results. Analysis of the modelling results showed that the real private consumption results generated by MONASH are tightly correlated with the direct benefits of the program, as identified by Applied Economics. In order to estimate the impact of the program beyond 2020, it is therefore possible to extrapolate the consumption results out to 2050 using the direct benefit data as a base. These extrapolated results are shown in Exhibit 3—the Centre of Policy Studies is confident that had they been able to extend the MONASH simulation out to 2050, the MONASH results for private consumption would have been close to those shown in Exhibit 3. According to Exhibit 3, real private consumption would be around 1 per cent higher in 2050 than would otherwise have been the case as a result of the program.

Exhibit 3

REAL PRIVATE CONSUMPTION FOLLOWING THE PROGRAM: 2004–2050



Source: MONASH modelling results

Using the data in Exhibit 3, Exhibit 4 below shows—for varying discount rates—the variation in household consumption in 2003 that would have an equivalent welfare effect to the variation in household consumption caused by the policy for the period 2004 to 2050. The calculations in Exhibit 4 are therefore broadly equivalent to net present value calculations—in welfare terms—for the program. For example, using a discount rate of 5 per cent, the program is estimated to generate a stream of welfare benefits between 2004–2050 equivalent to a one–off increase in welfare in 2003 of around 2.5 per cent. In dollar terms, this equates to an increase in consumption in 2003 of around $10.7 billion.

As can be seen from Exhibit 4, the program generates positive benefits for all discount rates below 9.6 per cent—this is therefore approximately the internal rate of return on the program.

Exhibit 4

CALCULATION OF WELFARE EFFECT OF PROGRAM

Discount rate	3	5	9	9.65	10	15
Equivalent % deviation in household consumption in 2003	5.78	2.59	0.17	0.00	-0.08	-0.58
Equivalent $ deviation in household consumption in 2003 ($ billion)	23.99	10.75	0.71	0.00	-0.33	-2.41

The MONASH forecat for real private consumption in 2003 is $415 billion
Source: MONASH modelling results

These welfare benefits accrue disproportionately to program participants, although all Australians benefit from reduced tax rates in the later years of the program[1]. The impact on public sector finances is, by assumption, neutral.

Sensitivity Analysis

In order to test the sensitivity of the results to the assumption that the displacement rate for the earnings of non–participants in the program is 10 per cent, the model was also run using a displacement rate assumption of 30 per cent[2]. The results show that the increase in the displacement rate delays the benefits of the program by a number of years, and reduces the gain to consumption from around 1 per cent over business–as–usual levels in 2050 to around 0.8 per cent. Exhibit 5 below shows the welfare effects of the program under the pessimistic displacement rate assumption. The pessimistic displacement rate assumption reduces the internal rate of return on the program from around 9.6 per cent to around 7.8 per cent.

Exhibit 5

CALCULATION OF WELFARE EFFECT OF PROGRAM: PESSIMISTIC DISPLACEMENT RATE ASSUMPTION

Discount rate	3	5	7	7.76	10	15
Equivalent % deviation in household consumption in 2003	3.73	1.39	0.26	0.00	-0.46	-0.74
Equivalent $ deviation in household consumption in 2003 ($ billion)	15.48	5.77	1.08	0.00	-1.91	-3.07

Source: MONASH modelling results

[1] The modelling undertaken for this exercise does not quantify the relative benefits accruing to program participants and non–participants. Further modelling would be required to estimate these impacts.

[2] As assumption that the displacement rate was equal to 20 per cent would produce results roughly half way between those obtained in relation to the 10 and 30 per cent assumptions respectively.

Consistency with Earlier Results

As noted earlier, Applied Economics concluded that an education and training program that increased the proportion of young people achieving Year 12 equivalent education from 80 to 90 per cent for the five–year cohort 2003 to 2007 would have a net present value of around $8.2 billion using a discount rate of 5 per cent, or $4.6 million discounted at 7 per cent.

It is not possible to make a direct comparison between the Applied Economics results and those obtained by the MONASH model in this exercise. There are a number of minor differences between the two analyses, in particular that Applied Economics:

- model the program for a five year cohort, while the current analysis examines an on–going policy;
- explicitly include benefits to employers arising from the program while these are derived endogenously in MONASH;
- include benefits accruing from the program after 2050 in calculating the NPV of the program; and
- define welfare gains in absolute terms rather than on a per capita basis as in MONASH (this means that fixed welfare gains arising from the program become less valuable in MONASH over time as the population grows).

Appendix 1 in Attachment A presents an analysis that attempts to address the above issues to derive comparable NPV figures from the Applied Economics and the MONASH results. This analysis shows that, if benefits beyond 2050 are included and the program is implemented on an on–going (rather than one–off) basis, MONASH estimates of the NPV of the program are around $19 billion, while the Applied Economics equivalent result is around $23 billion. Given the minor differences between the two approaches used, the two results are, on balance, broadly consistent. (The remaining difference is likely to be due largely to the general equilibrium effects underlying the MONASH analysis.)

4. Conclusions

A program to increase the proportion of young people who achieve a Year 12 equivalent education from 80 to 90 per cent requires an investment in the short term—initially, participation in the program results in less labour input to the economy, and taxes are increased to finance extra provision of education services. As a result, following the implementation of the program, GDP falls relative to business–as–usual levels between 2004 and 2014, and private consumption falls relative to business–as–usual levels between 2004 and 2011.

In the longer run however, the benefits of the program outweigh its costs. Over time, labour inputs increase and taxes fall as a result of the additional economic activity generated by the program. In 2020, GDP is 0.28 per cent (or around $1.8 billion in today's terms) greater than would otherwise have been the case. In terms of welfare, MONASH modelling results show that the policy will generate a rate of return of around 9.6 per cent over the period 2004 to 2050. While these benefits accrue disproportionately to program participants, in the program's later years, all Australians benefit from lower taxes as a result of the program. The impact on public sector finances is, by assumption, neutral.

The short term investment required to generate longer term benefits from the program is therefore a one–off net cost—once the program has been in place for some years, its on–going net benefit/cost impact is substantially positive. This one–off short term cost could be viewed as a cost made necessary today by past inaction to improve educational achievement—had achievement levels been higher in past years, it is possible that the economy could already be reaping the benefits generated when a higher proportion of young people complete Year 12 equivalent education.

These results are sensitive to the assumption made about the rate at which extra earnings generated for program participants displace the earnings of other workers—as the displacement rate increases, the long term increases in GDP and private consumption brought about by the program are reduced, and the rate of return to the program between 2004–2050 falls. Nevertheless, even at relatively higher displacement rates, the long term economic impact of the program is positive.

It is also important to note that the improvement in education achievement rates embodied in the program modelled in this exercise is substantial—an increase in the proportion of young people completing Year 12 equivalent education to 90 per cent represents a significant increase in relation to current achievement levels. A program which aimed to increase Year 12 equivalent education by a relatively smaller proportion, or which staggered the increase in achievement rates over time, may have relatively lower economic costs in the short term. Conversely, the long term economic benefits arising from such a program may also be relatively reduced.

ATTACHMENT A

The economy-wide benefits of an increase in the proportion of students achieving year 12 equivalent education

by

Peter B. Dixon and Maureen T. Rimmer

Centre of Policy Studies

15 January, 2003

1. Introduction

Table 1 is taken from a report entitled *Realising Australia's Commitment to Young People* prepared for the Dusseldorp Skills Forum by Applied Economics, November 2002 (hereafter the AE report).[3] The table shows costs and benefits of a program outlined in the AE report which would result in an increase from 80 per cent to 90 per cent in the proportion of young people who achieve Year 12 equivalent education.

Our objective is to subject the AE education and training program ("the AE program")[4] to a macroeconomic analysis. We do this by translating the program into shocks to be applied to the MONASH model[5] and then conducting simulations showing deviations from business-as-usual forecasts caused by these shocks.

The paper is organised as follows. In section 2 we interpret the AE numbers in Table 1. In section 3 we convert the AE program from a once-off policy dealing with a single five-year cohort of potential early school leavers into an ongoing policy through to 2050. In section 4 we report our central MONASH simulation of the effects of the ongoing policy. Section 5 reports a

---

[3] We thank the principal author of the AE report, Peter Abelson, for taking time to answer our queries concerning the report. He is, of course, not responsible for any misinterpretations that we may have made.

[4] The AE report incorporated a package of labour market programs (LMPs) to supplement the proposed education and training program—the LMPs are *not* considered in this modelling exercise.

[5] A brief description of MONASH is in Appendix 2.

Table 1. Direct effects of providing further school-level education to the 2003 to 2007 cohort ($m, 2002 prices)*

		2004	2005	2006	2007	2008	2009	2010	Present value in 2011 of incomes from 2011 to 2050
	Costs of program								
1	Costs to government[a]	304	492	573	577	579	271	72	
2	Expenditures by students[b]	40	66	76	76	76	36	9	
3	Total cost	344	558	649	653	655	307	81	
	Benefits of program								
4	Net earnings of students[c]	-181	-367	-362	-274	-156	150	513	13,578
5	Social benefits[d]						30	102	2,715
6	Displacement[e]						-15	-51	-1,358
7	Total benefits[f]	-181	-367	-362	-274	-156	165	564	14,935

* This is a condensed version of AE's Table S1.

[a] This includes the costs of extra school places, extra apprenticeships and traineeships, and extra transition programs.

[b] This includes items such as school books and uniforms.

[c] Increase in earnings less earnings foregone during study.

[d] This covers better social behaviour associated with higher educational achievement. For example, AE quote research showing that people with Year 12 education are less likely to commit crimes than those without Year 12 education.

[e] This allows for displacement by program participants of other workers. AE assume that the earnings of people who do not participate in the program will be reduced by 10 per cent of the extra earnings of those who do participate in the program. Thus, the number in the 6th row of the final column is -1/10 times the number in the 4th row. In section 5, we increase displacement from 10 per cent to 30 per cent. In terms of Table 1, we multiply the numbers in row 6 by three.

[f] AE included an extra (relatively minor) benefit entitled "Benefits to employers". This covered extra profitability associated with employing better educated higher productivity workers. We have left this out of our analysis because the MONASH model, that we will be using in sections 4 and 5 to analyse the program, deals with this issue endogenously.

sensitivity simulation. We adopt less optimistic assumptions than that in the central case for the effects of additional education for young people on employment opportunities and wages of other people. Concluding remarks are in section 6.

2. Interpretation of Table 1: costs and benefits of an increase in the proportion of students achieving Year 12 equivalent education, estimates for the 2003 to 2007 cohort

To understand the pattern of the figures across the years in Table 1, it is necessary to understand the timing of the AE program. The figures refer to costs and benefits of a program that targets young people who, in the absence of the program, would have completed their education at Years 9, 10 and 11 in each of the 5 years from 2003 to 2007.

Costs

In 2004 the program is directed at potential early school leavers at the end of 2003 and costs $344 million. In 2005 the program is directed at potential early school leavers at the end of 2004 but also involves expenses associated with the continuing education of some of the students captured by the program at the end of 2003 (those who would have left school at the end of 2003 having completed only Year 9 or 10). Thus, costs associated with the program in 2005 ($558 million) are greater than those in 2004 ($344 million). In 2006 the program is directed at potential early school leavers at the end of 2005 but also involves expenses associated with the continuing students captured by the program at the end of 2003 and the end of 2004. Thus, again we see an increase in costs ($649 million in 2006 compared with $558 million in the previous year). In 2007 the program is directed at potential early school leavers at the end of 2006 but also involves expenses associated with continuing students captured at the end of 2004 and the end 2005. By 2007, it is assumed that students from the end of 2003 would have completed their participation in the program. Thus, the cost of the program in 2007 is about the same as that in 2006. Similarly, the cost of the program in 2008 is about the same as that in 2006. By 2009, the program is trailing off, with costs falling to $307 million. In 2009 the program is concerned only with continuing students captured at the end of 2006 and the end of 2007. In 2010, the program is concerned only with continuing students captured at the end of 2007, and costs fall to $81 million. Beyond 2010, the AE program is finished and there are no further expenses.

Benefits

In 2004, the program reduces the wages received by young people by $181 million. This is the reduced earnings in 2004 of potential early school leavers captured by the program at the end of 2003. In 2005, the program reduces the wages received by young people by $367 million. This is the reduced earnings in 2005 of potential early school leavers captured at the end of 2004 and also of those continuing in the program from the end of 2003. The 2005 number ($367 million) includes an offset for the program-related increase in wage rates and workforce participation by students who complete the program at the end of 2004. In 2006 the net reduction in student earnings peaks

at $362 million. This figure is a combination of earnings losses by students captured at the end of 2005 and by those continuing in the program from the end of 2003 and the end of 2004. Offsets from increased earnings by students completing the program in 2004 and 2005 are taken into account. In 2007 and 2008 offsets become increasingly important as the number of graduates from the program, with increased wage and participation rates, swells. By 2009 and 2010 there are few students left in the program. Thus, as a group, the students who at any stage participated in the program have higher earnings than they would have had in the absence of the program. Beyond 2010, there are no students suffering reduced employment due to continued studies. For the group of students who participated in the program, AE estimate that the present value in 2011 of the program-related increase in their earnings is $13,578 million.

3. Translating the single cohort estimates into estimates for an ongoing program

AE analyse a single program focused on the cohort of early school leavers in 2003 to 2007. We think it is more realistic to look at an ongoing policy. If a program were implemented that raised the proportion of Year 12 completers from 80 per cent to 90 per cent then it seems unlikely that it would be abandoned when it had finished dealing with early school leavers from 2007.

In translating the AE estimates for a single cohort program into estimates for an ongoing policy we constructed Tables 2 to 5. In Table 2 the program A column refers to rows 4 and 6 of Table 1. It shows the net earnings of students in the AE program adjusted for displacement for each of the years 2004 to 2050. For the years beyond 2010, we take the annual net earnings adjusted for displacement as $678m. This is consistent with the present value numbers in the final column of rows 4 and 6 in Table 1.[6] The B column in Table 2 refers to a new AE program directed at potential early school leavers from the end of 2008 to the end of 2013. Program B is the same as program A except that it is scaled up by the factor 1.051 (= 1.01^5) to allow for 1 per cent annual population growth over the five years between the commencements of the two programs. Similarly, columns C to J of Table 2 refer to new AE programs directed at potential early school leavers from the years 2014 to 2018, 2019 to 2023, etc. The TOTAL column in Table 2 is the sum across programs A to J. It shows for each year net earnings adjusted for displacement for all the programs, that is it shows adjusted net earnings from the ongoing policy. In the "with wage growth" column, we have

[6] AE used a discount rate of 5 per cent: $\sum_{t=2011}^{t=2050} 678 / (1.05^{t-2011}) = 13578 - 1358$.

Table 2. Net extra earnings from ongoing policy ($m, 2002 prices)

	prog A	prog B	prog C	prog D	prog E	prog F	prog G	prog H	prog I	prog J	TOTAL	with wage growth	% of total wages
2004	-181	0	0	0	0	0	0	0	0	0	-181	-181	-0.046
2005	-367	0	0	0	0	0	0	0	0	0	-367	-372	-0.093
2006	-362	0	0	0	0	0	0	0	0	0	-362	-371	-0.091
2007	-274	0	0	0	0	0	0	0	0	0	-274	-285	-0.068
2008	-156	0	0	0	0	0	0	0	0	0	-156	-164	-0.038
2009	135	-190	0	0	0	0	0	0	0	0	-55	-59	-0.013
2010	462	-386	0	0	0	0	0	0	0	0	76	82	0.018
2011	678	-380	0	0	0	0	0	0	0	0	298	326	0.069
2012	678	-288	0	0	0	0	0	0	0	0	390	433	0.089
2013	678	-164	0	0	0	0	0	0	0	0	514	578	0.116
2014	678	142	-200	0	0	0	0	0	0	0	620	706	0.138
2015	678	486	-405	0	0	0	0	0	0	0	758	874	0.166
2016	678	713	-400	0	0	0	0	0	0	0	991	1157	0.214
2017	678	713	-303	0	0	0	0	0	0	0	1088	1287	0.231
2018	678	713	-172	0	0	0	0	0	0	0	1219	1460	0.255
2019	678	713	149	-210	0	0	0	0	0	0	1330	1614	0.275
2020	678	713	510	-426	0	0	0	0	0	0	1475	1814	0.300
2021	678	713	749	-420	0	0	0	0	0	0	1720	2142	0.346
2022	678	713	749	-318	0	0	0	0	0	0	1822	2299	0.363
2023	678	713	749	-181	0	0	0	0	0	0	1959	2504	0.387
2024	678	713	749	157	-221	0	0	0	0	0	2076	2688	0.406
2025	678	713	749	536	-448	0	0	0	0	0	2229	2923	0.431
2026	678	713	749	787	-442	0	0	0	0	0	2486	3302	0.476
2027	678	713	749	787	-334	0	0	0	0	0	2593	3490	0.492
2028	678	713	749	787	-190	0	0	0	0	0	2737	3732	0.514
2029	678	713	749	787	165	-232	0	0	0	0	2860	3950	0.532
2030	678	713	749	787	564	-471	0	0	0	0	3020	4226	0.556
2031	678	713	749	787	827	-464	0	0	0	0	3291	4664	0.600
2032	678	713	749	787	827	-351	0	0	0	0	3403	4886	0.614
2033	678	713	749	787	827	-200	0	0	0	0	3555	5170	0.635
2034	678	713	749	787	827	173	-244	0	0	0	3684	5427	0.652
2035	678	713	749	787	827	592	-495	0	0	0	3853	5750	0.675
2036	678	713	749	787	827	870	-488	0	0	0	4137	6254	0.718
2037	678	713	749	787	827	870	-369	0	0	0	4255	6517	0.731
2038	678	713	749	787	827	870	-210	0	0	0	4414	6848	0.751
2039	678	713	749	787	827	870	182	-256	0	0	4550	7151	0.766
2040	678	713	749	787	827	870	623	-520	0	0	4727	7526	0.788
2041	678	713	749	787	827	870	914	-513	0	0	5026	8105	0.830
2042	678	713	749	787	827	870	914	-388	0	0	5150	8414	0.842
2043	678	713	749	787	827	870	914	-221	0	0	5318	8800	0.860
2044	678	713	749	787	827	870	914	191	-269	0	5460	9154	0.875
2045	678	713	749	787	827	870	914	654	-546	0	5647	9589	0.896
2046	678	713	749	787	827	870	914	961	-539	0	5960	10253	0.936
2047	678	713	749	787	827	870	914	961	-408	0	6091	10615	0.947
2048	678	713	749	787	827	870	914	961	-232	0	6267	11063	0.965
2049	678	713	749	787	827	870	914	961	201	-283	6417	11475	0.978
2050	678	713	749	787	827	870	914	961	688	-574	6613	11979	0.998

The program A column refers to rows 4 and 6 of Table 1. The B column refers to a new AE program directed at potential early school leavers from the end of 2008 to the end of 2013. Program B is the same as program A except that it is scaled up by the factor 1.051 (= 1.01^5) to allow for 1 per cent annual population growth over the five years between the commencements of the two programs. Similarly, columns C to J refer to new AE programs directed at potential early school leavers from the years 2014 to 2018, 2019 to 2023, etc. The TOTAL column is the sum across programs A to J. In the "with wage growth" column, we have introduced 1.3 per cent annual growth in real wage rates and applied this growth rate to the TOTAL column. In the final column we have expressed the "with wage growth" column as a per cent of our basecase forecast of Australia's wage bill in 2002 prices.

Table 3. Costs of ongoing policy ($m, 2002 prices)

	prog A	prog B	prog C	prog D	prog E	prog F	Prog G	prog H	prog I	prog J	TOTAL	with wage growth	% of total wages
2004	344	0	0	0	0	0	0	0	0	0	344	344	0.088
2005	558	0	0	0	0	0	0	0	0	0	558	565	0.141
2006	649	0	0	0	0	0	0	0	0	0	649	666	0.163
2007	653	0	0	0	0	0	0	0	0	0	653	679	0.161
2008	655	0	0	0	0	0	0	0	0	0	655	690	0.159
2009	307	362	0	0	0	0	0	0	0	0	669	713	0.160
2010	81	586	0	0	0	0	0	0	0	0	667	721	0.158
2011	0	682	0	0	0	0	0	0	0	0	682	747	0.159
2012	0	686	0	0	0	0	0	0	0	0	686	761	0.157
2013	0	688	0	0	0	0	0	0	0	0	688	773	0.155
2014	0	323	380	0	0	0	0	0	0	0	703	800	0.156
2015	0	85	616	0	0	0	0	0	0	0	702	809	0.154
2016	0	0	717	0	0	0	0	0	0	0	717	837	0.155
2017	0	0	721	0	0	0	0	0	0	0	721	853	0.153
2018	0	0	724	0	0	0	0	0	0	0	724	867	0.152
2019	0	0	339	399	0	0	0	0	0	0	738	896	0.152
2020	0	0	89	648	0	0	0	0	0	0	737	907	0.150
2021	0	0	0	753	0	0	0	0	0	0	753	948	0.152
2022	0	0	0	758	0	0	0	0	0	0	758	976	0.151
2023	0	0	0	760	0	0	0	0	0	0	760	1001	0.150
2024	0	0	0	356	420	0	0	0	0	0	776	1046	0.152
2025	0	0	0	94	681	0	0	0	0	0	775	1068	0.150
2026	0	0	0	0	792	0	0	0	0	0	792	1117	0.152
2027	0	0	0	0	797	0	0	0	0	0	797	1150	0.151
2028	0	0	0	0	799	0	0	0	0	0	799	1180	0.150
2029	0	0	0	0	375	441	0	0	0	0	816	1232	0.152
2030	0	0	0	0	99	716	0	0	0	0	814	1259	0.150
2031	0	0	0	0	0	832	0	0	0	0	832	1316	0.152
2032	0	0	0	0	0	837	0	0	0	0	837	1355	0.151
2033	0	0	0	0	0	840	0	0	0	0	840	1390	0.150
2034	0	0	0	0	0	394	464	0	0	0	857	1452	0.152
2035	0	0	0	0	0	104	752	0	0	0	856	1483	0.150
2036	0	0	0	0	0	0	875	0	0	0	875	1551	0.152
2037	0	0	0	0	0	0	880	0	0	0	880	1596	0.151
2038	0	0	0	0	0	0	883	0	0	0	883	1638	0.150
2039	0	0	0	0	0	0	414	487	0	0	901	1711	0.152
2040	0	0	0	0	0	0	109	790	0	0	900	1748	0.150
2041	0	0	0	0	0	0	0	919	0	0	919	1827	0.152
2042	0	0	0	0	0	0	0	925	0	0	925	1881	0.151
2043	0	0	0	0	0	0	0	928	0	0	928	1930	0.150
2044	0	0	0	0	0	0	0	435	512	0	947	2016	0.152
2045	0	0	0	0	0	0	0	115	831	0	946	2059	0.150
2046	0	0	0	0	0	0	0	0	966	0	966	2153	0.152
2047	0	0	0	0	0	0	0	0	972	0	972	2216	0.151
2048	0	0	0	0	0	0	0	0	975	0	975	2275	0.150
2049	0	0	0	0	0	0	0	0	457	538	995	2375	0.152
2050	0	0	0	0	0	0	0	0	121	873	994	2426	0.150

Table 3 was constructed in a similar way to Table 2. Table 3 refers to row 3 of Table 1.

Table 4. Social benefits of ongoing policy ($m, 2002 prices)

	prog A	prog B	prog C	prog D	prog E	prog F	Prog G	prog H	prog I	prog J	TOTAL	with wage growth	% of total wages
2004	0	0	0	0	0	0	0	0	0	0	0	0	0.000
2005	0	0	0	0	0	0	0	0	0	0	0	0	0.000
2006	0	0	0	0	0	0	0	0	0	0	0	0	0.000
2007	0	0	0	0	0	0	0	0	0	0	0	0	0.000
2008	0	0	0	0	0	0	0	0	0	0	0	0	0.000
2009	30	0	0	0	0	0	0	0	0	0	30	32	0.007
2010	102	0	0	0	0	0	0	0	0	0	102	110	0.024
2011	151	0	0	0	0	0	0	0	0	0	151	165	0.035
2012	151	0	0	0	0	0	0	0	0	0	151	167	0.035
2013	151	0	0	0	0	0	0	0	0	0	151	169	0.034
2014	151	32	0	0	0	0	0	0	0	0	182	207	0.041
2015	151	107	0	0	0	0	0	0	0	0	258	297	0.057
2016	151	158	0	0	0	0	0	0	0	0	309	361	0.067
2017	151	158	0	0	0	0	0	0	0	0	309	366	0.066
2018	151	158	0	0	0	0	0	0	0	0	309	370	0.065
2019	151	158	33	0	0	0	0	0	0	0	342	415	0.071
2020	151	158	113	0	0	0	0	0	0	0	422	519	0.086
2021	151	158	166	0	0	0	0	0	0	0	475	592	0.096
2022	151	158	166	0	0	0	0	0	0	0	475	600	0.095
2023	151	158	166	0	0	0	0	0	0	0	475	608	0.094
2024	151	158	166	35	0	0	0	0	0	0	510	661	0.100
2025	151	158	166	118	0	0	0	0	0	0	594	779	0.115
2026	151	158	166	175	0	0	0	0	0	0	650	864	0.125
2027	151	158	166	175	0	0	0	0	0	0	650	875	0.123
2028	151	158	166	175	0	0	0	0	0	0	650	887	0.122
2029	151	158	166	175	37	0	0	0	0	0	687	949	0.128
2030	151	158	166	175	124	0	0	0	0	0	775	1084	0.143
2031	151	158	166	175	184	0	0	0	0	0	834	1182	0.152
2032	151	158	166	175	184	0	0	0	0	0	834	1198	0.151
2033	151	158	166	175	184	0	0	0	0	0	834	1213	0.149
2034	151	158	166	175	184	38	0	0	0	0	873	1286	0.154
2035	151	158	166	175	184	131	0	0	0	0	965	1440	0.169
2036	151	158	166	175	184	193	0	0	0	0	1027	1553	0.178
2037	151	158	166	175	184	193	0	0	0	0	1027	1574	0.176
2038	151	158	166	175	184	193	0	0	0	0	1027	1594	0.175
2039	151	158	166	175	184	193	40	0	0	0	1068	1678	0.180
2040	151	158	166	175	184	193	137	0	0	0	1165	1855	0.194
2041	151	158	166	175	184	193	203	0	0	0	1231	1984	0.203
2042	151	158	166	175	184	193	203	0	0	0	1231	2010	0.201
2043	151	158	166	175	184	193	203	0	0	0	1231	2036	0.199
2044	151	158	166	175	184	193	203	42	0	0	1273	2134	0.204
2045	151	158	166	175	184	193	203	144	0	0	1375	2335	0.218
2046	151	158	166	175	184	193	203	213	0	0	1444	2484	0.227
2047	151	158	166	175	184	193	203	213	0	0	1444	2516	0.225
2048	151	158	166	175	184	193	203	213	0	0	1444	2549	0.222
2049	151	158	166	175	184	193	203	213	45	0	1489	2662	0.227
2050	151	158	166	175	184	193	203	213	152	0	1596	2891	0.241

Table 4 was constructed in a similar way to Table 2. Table 4 refers to row 5 of Table 1. The social benefits associated with the program covers better social behaviour associated with higher educational achievement. e.g. reduced crime.

Table 5. Total net benefits of ongoing policy ($m, 2002 prices)

	prog A	prog B	prog C	prog D	prog E	prog F	prog G	prog H	prog I	prog J	TOTAL	with wage growth	% of total wages
2004	-525	0	0	0	0	0	0	0	0	0	-525	-525	-0.134
2005	-925	0	0	0	0	0	0	0	0	0	-925	-937	-0.233
2006	-1011	0	0	0	0	0	0	0	0	0	-1011	-1037	-0.253
2007	-927	0	0	0	0	0	0	0	0	0	-927	-964	-0.229
2008	-811	0	0	0	0	0	0	0	0	0	-811	-854	-0.197
2009	-142	-552	0	0	0	0	0	0	0	0	-694	-740	-0.166
2010	483	-972	0	0	0	0	0	0	0	0	-489	-529	-0.115
2011	829	-1063	0	0	0	0	0	0	0	0	-234	-256	-0.054
2012	829	-974	0	0	0	0	0	0	0	0	-145	-161	-0.033
2013	829	-852	0	0	0	0	0	0	0	0	-24	-26	-0.005
2014	829	-149	-580	0	0	0	0	0	0	0	100	113	0.022
2015	829	508	-1022	0	0	0	0	0	0	0	315	363	0.069
2016	829	871	-1117	0	0	0	0	0	0	0	583	681	0.126
2017	829	871	-1024	0	0	0	0	0	0	0	676	800	0.144
2018	829	871	-896	0	0	0	0	0	0	0	804	963	0.169
2019	829	871	-157	-610	0	0	0	0	0	0	934	1133	0.193
2020	829	871	534	-1074	0	0	0	0	0	0	1160	1426	0.236
2021	829	871	916	-1174	0	0	0	0	0	0	1442	1796	0.290
2022	829	871	916	-1076	0	0	0	0	0	0	1539	1942	0.307
2023	829	871	916	-942	0	0	0	0	0	0	1674	2139	0.331
2024	829	871	916	-165	-641	0	0	0	0	0	1810	2344	0.354
2025	829	871	916	561	-1129	0	0	0	0	0	2048	2686	0.396
2026	829	871	916	962	-1234	0	0	0	0	0	2344	3114	0.449
2027	829	871	916	962	-1131	0	0	0	0	0	2447	3293	0.464
2028	829	871	916	962	-990	0	0	0	0	0	2588	3529	0.486
2029	829	871	916	962	-173	-673	0	0	0	0	2731	3772	0.508
2030	829	871	916	962	589	-1186	0	0	0	0	2981	4170	0.549
2031	829	871	916	962	1011	-1297	0	0	0	0	3292	4666	0.600
2032	829	871	916	962	1011	-1189	0	0	0	0	3400	4882	0.614
2033	829	871	916	962	1011	-1040	0	0	0	0	3549	5161	0.634
2034	829	871	916	962	1011	-182	-708	0	0	0	3699	5450	0.655
2035	829	871	916	962	1011	619	-1247	0	0	0	3962	5912	0.694
2036	829	871	916	962	1011	1063	-1363	0	0	0	4289	6485	0.744
2037	829	871	916	962	1011	1063	-1249	0	0	0	4402	6742	0.756
2038	829	871	916	962	1011	1063	-1093	0	0	0	4559	7072	0.775
2039	829	871	916	962	1011	1063	-191	-744	0	0	4717	7413	0.794
2040	829	871	916	962	1011	1063	651	-1310	0	0	4993	7948	0.832
2041	829	871	916	962	1011	1063	1117	-1432	0	0	5337	8607	0.881
2042	829	871	916	962	1011	1063	1117	-1313	0	0	5456	8913	0.892
2043	829	871	916	962	1011	1063	1117	-1149	0	0	5620	9301	0.909
2044	829	871	916	962	1011	1063	1117	-201	-782	0	5786	9700	0.927
2045	829	871	916	962	1011	1063	1117	684	-1377	0	6076	10318	0.964
2046	829	871	916	962	1011	1063	1117	1174	-1505	0	6438	11075	1.011
2047	829	871	916	962	1011	1063	1117	1174	-1380	0	6563	11437	1.021
2048	829	871	916	962	1011	1063	1117	1174	-1207	0	6736	11890	1.037
2049	829	871	916	962	1011	1063	1117	1174	-211	-822	6910	12357	1.053
2050	829	871	916	962	1011	1063	1117	1174	719	-1447	7215	13070	1.089

Table 5 is Table 2 minus Table 3 plus Table 4.

introduced 1.3 per cent annual growth in real wage rates and applied this growth rate to the TOTAL column. A trend growth in real wages of 1.3 per cent is a reasonable forecast in light of the performance of the Australian economy over the last 30 years. In the final column of Table 2 we have expressed the "with wage growth" column as a per cent of our basecase forecast of Australia's wage bill in 2002 prices. In making the forecast we assumed longrun annual employment growth of 1 per cent (as well as real wage growth of 1.3 per cent). As can be seen from the final column of Table 2, an ongoing AE policy is projected to generate increased net earnings by 2050 equivalent to an increase in labour input of 0.998 per cent.

Tables 3 and 4 were constructed in a similar way to Table 2. Table 3 refers to row 3 of Table 1 and Table 4 refers to row 5. Table 5 is Table 2 *minus* Table 3 *plus* Table 4. The final column in Table 5 shows the total direct net benefits of the ongoing policy as a per cent of total wages. In 2004 the ongoing policy is equivalent to a loss of total labour input to the economy of 0.134 per cent. The ongoing policy continues to generate small losses to the economy until 2014. Beyond 2014, the ongoing policy generates an ever increasing gain to the economy, rising to the equivalent of a 1.089 per cent increase in labour input in 2050. The gain to the economy increases steadily reflecting the ever increasing proportion of the workforce up to 2050 that are graduates from programs A to J. While we have not taken the numerical analysis beyond 2050, it is clear that the gains to the economy would eventually stabilise as participants from early programs retire.

4. Monash simulation, central case

This section contains results from a simulation with the MONASH model of the macroeconomic effects of the implementing the ongoing policy specified in Tables 2 to 4. In subsection 4.1 we list the key assumptions underlying the simulation and in subsection 4.2 we present results for our central simulation. In its current form MONASH is set up for simulations out to the year 2020. This is a disadvantage in the current context where the policy has significant effects well beyond 2020. However, as we will see in subsection 4.3, the simulation results up to 2020 are strongly suggestive of those that would be achieved if the model were extended, for example, to 2050**.**

4.1. Key assumptions

Public expenditure and taxes

We assume that the ongoing policy makes no difference to the path of real public consumption of all goods and services except education. Government provision of education

services [which include all of the services listed in note (a) to Table 1] increases in accordance with the costs identified in Table 3. Tax rates on labour and capital are adjusted to leave the ratio of the public sector deficit to GDP unchanged by the ongoing policy. Under AE assumptions a small share of the direct costs (largely school books and uniforms) in Table 3 should be borne by participating students. We ignore this complication. In effect we assume that the government buys the students books and uniforms and that the private sector pays for these via taxes.

Rates of return on capital

In simulations of the effects of changes in policy and other exogenous variables, MONASH allows for short-run divergences in after-tax rates of return on industry capital stocks from their levels in the basecase forecasts. Short-run increases/decreases in rates of return cause increases/decreases in investment and capital stocks, thereby gradually eroding the initial divergences in after-tax rates of return. A feature of the ongoing policy is that the capital/rate-of-return adjustment is far from completed in our simulation period (2004 to 2020). Because the shocks introduced in our simulation are eventually favourable, rates of return are elevated at the end of the simulation period.

Production technologies

MONASH contains variables describing: primary-factor and intermediate-input-saving technical change in current production; input-saving technical change in capital creation; and input-saving technical change in the provision of margin services. In the simulations described in this paper, all of these variables are exogenous. We move a variable representing general labour-saving technical change away from its forecast path to introduce the social benefits (Table 4) of the ongoing policy. In other words, we represent the direct benefits of reductions in crime and other social improvements associated with the policy as a reduction in the amount of labour required to support any given level of output.

Labour market

We assume that wages rates adjust to ensure that in the long run employment will absorb an exogenously given share of the available effective supply of labour. Under the ongoing policy, there are changes in the effective supply of labour reflecting: withdrawal of students into additional study; increased workforce participation of graduates from the on-growing program; and increased effectiveness of graduates. These changes in effective supply (for our central case) are summarised

in the final column of Table 2. Because of assumed stickiness in real after-tax wage rates, adjustments to changes in effective labour supply are not instantaneous. However, eventually an *x* per cent increase in effective labour supply leads to an *x* per cent increase in employment of effective labour units. This assumption is consistent with conventional macro-economic modelling in which the NAIRU[7] is exogenous.

4.2. MONASH results: central simulation

Charts 1 to 5 show MONASH results as percentage deviations from basecase forecasts. Highlights of the results include the following.

- With the ongoing policy, real GDP in 2020 is increased by 0.28 per cent (Chart 1). An increase of 0.28 per cent in Australia's current GDP would be worth about $1.82 billion. The increase in GDP in 2020 arises from a combination of three factors. The first is the effective increase in labour input (0.33 per cent), mainly reflecting increased efficiency and participation by program graduates. With labour contributing about 65 per cent of GDP, the effective increase in labour input explains an increase in GDP of 0.21 per cent (= 0.65*0.33). The second factor is the general increase in productivity reflecting the social benefit. As can be seen in Chart 1, by 2020 this is worth about 0.05 per cent of GDP. The third factor is the increase in capital. By 2020 the capital stock is about 0.05 per cent higher with the ongoing policy than it otherwise would have been. With capital contributing about 35 per cent of GDP, the increase in capital explains an increase in GDP of 0.02 per cent (= 0.35*0.05).

- Initially, the ongoing policy reduces GDP (Chart 1). For example, in 2006 GDP is down by 0.15 per cent mainly as a result of the withdrawal of labour associated with increased participation by young people in education (Table 2). However, the short-run reduction in effective labour input also reflects our sticky-wage assumption. In the early years of the ongoing policy there are significant tax increases. These cause short-run increases in real before-tax wage rates (recall that we assume real after-tax wage stickiness). Increases in real before-tax wages reduce employment. They also reduce rates of return on capital and consequently cause reductions in investment (Chart 2). The reductions in investment explain the short-run reductions in capital (Chart 1). Another factor contributing to the short-run reduction in capital is the shift in national expenditure towards education, a highly labour-intensive activity. Eventually the capital stock recovers as wages adjust and effective labour supply increases.

[7] NAIRU is the Non-Accelerating Inflation Rate of Unemployment.

- By 2020, real private consumption is increased by 0.18 per cent (Chart 2). An increase of 0.18 per cent in Australia's current level of real private consumption would be worth about $0.72 billion. The increase in consumption is a reflection of increased real disposable income arising mainly from increased effective labour input.

- In the short run, real private consumption is reduced. In 2006 the reduction is 0.25 per cent (about $1 billion). This is explained by two factors: the reduction in effective labour input; and tax increases imposed by the government to finance increased expenditures on education.

- In combination, the short-run percentage movements in investment, private consumption and public consumption approximately match the short-run movement in GDP. Thus, there is little short-run movement in the balance of trade (Chart 3). Imports fall because of falls in private consumption and investment. The increase in public consumption provides only small stimulation to imports. Public consumption of education services is almost entirely domestically sourced. With imports falling and trade balanced exports must fall. This is facilitated by real appreciation (Chart 4). With reduced exports there is an increase in the terms of trade (Chart 5).

- In the longer term, the increases in private consumption and investment (Chart 2) generate increases in imports (Chart 3). This causes a downward adjustment in the real exchange rate (Chart 4) allowing an increase in exports (Chart 3). Corresponding to the increase in exports there is a reduction in the terms of trade (Chart 5).

4.3. Extending MONASH results to 2050 and beyond: the present value of the ongoing policy in the central case

As mentioned in section 3, the last column of Table 5 provides a measure for each year of the direct benefits of the ongoing program. In Chart 6 we have plotted these direct benefits as a share of private consumption rather than of the wage bill.[8] Chart 6 also contains the MONASH results for private consumption for 2004 to 2020. As can be seen from the chart, the MONASH consumption results are highly correlated with the direct benefits. On investigation we found that the MONASH graph for private consumption lies slightly below the graph for direct benefits because the ongoing policy raises returns to capital, thereby transferring some of the benefits of the

[8] Because private consumption and the wage bill are similar in magnitude, the direct benefit values plotted in Chart 6 are very similar to the numbers in Table 5.

policy to foreign owners of Australian capital. Exploiting the tight relationship between the direct benefit graph and the MONASH consumption results, we have extrapolated the consumption results out to 2050. We are confident that had we been able to extend the MONASH simulation to 2050 then the MONASH results for private consumption would have been close to the extrapolated results shown in Chart 6. Beyond 2050 we would expect the private consumption deviation to stabilise at about the 2050 level. As mentioned in section 3, the policy would mature by 2050 with the number of retirees from early programs roughly matching graduates entering the workforce from later programs.

In the present context, deviations in private consumption provide a reasonable measure of the economy-wide welfare effects in each year of the ongoing policy. However, it is not clear how these annual deviations should be added to form an overall indicator of whether the policy generates net benefits or losses. Here we will assume that it is appropriate for policy makers to discount percentage increases in household consumption in future years at the percentage rate *r*, that is they assess the present value of an *x* per cent increase in household consumption taking place in *t* years time as $x/[(1+r/100)^t]$. In Table 6 we have applied this idea to the MONASH and extrapolated results for private consumption for the period 2004 to 2050 (the results used in Chart 6).[9] We have also supplied calculations for the period 2004 to infinity, assuming that beyond 2050 the consumption deviation remains at the 2050 level. For a series of discount rates we have calculated the variation in household consumption in 2003 that would have an equivalent welfare effect to the variations in household consumption caused by the policy for the period 2004 to 2050 and for the period 2004 to infinity. As can be seen from Table 6, if we ignore benefits beyond 2050, then the ongoing policy generates positive benefits for discount rates below 9.654, that is the internal rate of return for the policy is 9.654 per cent. If we include benefits beyond 2050,then the internal rate of return is 10.148 per cent.

Table 6. Calculation of welfare effect of ongoing policy, central case

Discount rate (r)	3	5	9	9.654	10	10.148	15
Equivalent percentage deviation in household consumption in 2003, ignoring benefits beyond 2050	5.78	2.59	0.17	0.00	-0.08	-0.11	-0.58
Equivalent percentage deviation in household consumption in 2003,	14.19	4.64	0.37	0.14	0.04	0.00	-0.57

[9] AE also provides some present value calculations. A comparison of our calculations with theirs is provided in Appendix 1.

including benefits beyond 2050							

5. MONASH results under a pessimistic displacement assumption

As explained in note (e) to Table 1, AE assume 10 per cent displacement. Here we look at the sensitivity of the estimated benefits of the ongoing program to the displacement assumption.

Table 7, Chart 7 and Table 8 were constructed with 30 per cent displacement. They correspond to Table 5, Chart 6 and Table 6 in which we used the AE assumption of 10 per cent displacement.

By comparing the final columns in Tables 7 and 5 we see the effect of the change in the displacement assumption on the estimated direct benefits of the ongoing policy. In the first few years there is no effect because in the AE calculations displacement occurs only from 2009 onwards. However, in later years the displacement assumption becomes significant. Rather than being equivalent in 2050 to an increase in labour input of 1.089 per cent (Table 5), the direct benefit of the ongoing program under the pessimistic displacement assumption is reduced to 0.848 per cent (Table 7).

By comparing Charts 7 and 6 we see that the pessimistic displacement assumption lowers the graph for the policy-induced deviation in private consumption. Instead of crossing the horizontal axis in 2014 (Chart 6), with the pessimistic assumption the consumption graph does not cross the horizontal axis until 2016 (Chart 7). In 2050 the consumption deviation in Chart 6 was 1.01 per cent. Now, under the pessimistic assumption, the consumption deviation is Chart 7 for 2050 is reduced to 0.79 per cent.

Ignoring benefits beyond 2050, Table 8 gives the internal rate of return (the discount rate at which the present value of net benefits is zero) from the ongoing policy under the pessimistic assumption as 7.759 per cent. Including benefits beyond 2050, the internal rate of return is 8.520 per cent. Under the AE displacement assumption the ongoing policy showed an internal rates of return of 9.654 per cent and 10.148 per cent.

6. Concluding remarks

It will take a considerable time before there are significant benefits from a policy that increases the proportion of students that achieve Year 12 equivalent education. Under the AE assumptions, the central MONASH simulation shows that deviations in household consumption

caused by the policy would be negative for 11 years, 2004 to 2014. Under a more pessimistic assumption about displacement than that made by AE, policy-induced negative deviations persist for 13 years, 2004 to 2016. Because significant economy-wide benefits from the policy will be experienced only in the long run, it will take a considerable effort by far-sighted people to implement it. However, on the basis of the figures in the AE report, MONASH analysis shows that

Table 7. Total net benefits of ongoing policy ($m, 2002 prices), pessimistic displacement

	prog A	prog B	Prog C	prog D	prog E	prog F	prog G	prog H	prog I	prog J	TOTAL	with wage growth	% of total wages
2004	-525	0	0	0	0	0	0	0	0	0	-525	-525	-0.134
2005	-925	0	0	0	0	0	0	0	0	0	-925	-937	-0.233
2006	-1011	0	0	0	0	0	0	0	0	0	-1011	-1037	-0.253
2007	-927	0	0	0	0	0	0	0	0	0	-927	-964	-0.229
2008	-811	0	0	0	0	0	0	0	0	0	-811	-854	-0.197
2009	-172	-552	0	0	0	0	0	0	0	0	-724	-772	-0.173
2010	381	-972	0	0	0	0	0	0	0	0	-591	-639	-0.140
2011	678	-1063	0	0	0	0	0	0	0	0	-384	-421	-0.089
2012	678	-974	0	0	0	0	0	0	0	0	-296	-328	-0.068
2013	678	-852	0	0	0	0	0	0	0	0	-174	-196	-0.039
2014	678	-181	-580	0	0	0	0	0	0	0	-83	-94	-0.018
2015	678	400	-1022	0	0	0	0	0	0	0	57	65	0.012
2016	678	713	-1117	0	0	0	0	0	0	0	274	320	0.059
2017	678	713	-1024	0	0	0	0	0	0	0	367	434	0.078
2018	678	713	-896	0	0	0	0	0	0	0	495	593	0.104
2019	678	713	-190	-610	0	0	0	0	0	0	591	718	0.122
2020	678	713	421	-1074	0	0	0	0	0	0	738	907	0.150
2021	678	713	749	-1174	0	0	0	0	0	0	966	1203	0.195
2022	678	713	749	-1076	0	0	0	0	0	0	1064	1342	0.212
2023	678	713	749	-942	0	0	0	0	0	0	1198	1532	0.237
2024	678	713	749	-200	-641	0	0	0	0	0	1300	1683	0.254
2025	678	713	749	442	-1129	0	0	0	0	0	1454	1906	0.281
2026	678	713	749	787	-1234	0	0	0	0	0	1694	2250	0.325
2027	678	713	749	787	-1131	0	0	0	0	0	1796	2417	0.341
2028	678	713	749	787	-990	0	0	0	0	0	1938	2642	0.364
2029	678	713	749	787	-210	-673	0	0	0	0	2044	2823	0.380
2030	678	713	749	787	465	-1186	0	0	0	0	2206	3086	0.406
2031	678	713	749	787	827	-1297	0	0	0	0	2458	3484	0.448
2032	678	713	749	787	827	-1189	0	0	0	0	2566	3684	0.463
2033	678	713	749	787	827	-1040	0	0	0	0	2715	3948	0.485
2034	678	713	749	787	827	-221	-708	0	0	0	2826	4164	0.500
2035	678	713	749	787	827	489	-1247	0	0	0	2996	4472	0.525
2036	678	713	749	787	827	870	-1363	0	0	0	3262	4931	0.566
2037	678	713	749	787	827	870	-1249	0	0	0	3375	5168	0.580
2038	678	713	749	787	827	870	-1093	0	0	0	3531	5478	0.601
2039	678	713	749	787	827	870	-232	-744	0	0	3649	5734	0.614
2040	678	713	749	787	827	870	514	-1310	0	0	3827	6093	0.638
2041	678	713	749	787	827	870	914	-1432	0	0	4106	6622	0.678
2042	678	713	749	787	827	870	914	-1313	0	0	4225	6902	0.691
2043	678	713	749	787	827	870	914	-1149	0	0	4389	7264	0.710
2044	678	713	749	787	827	870	914	-244	-782	0	4513	7566	0.723
2045	678	713	749	787	827	870	914	540	-1377	0	4701	7983	0.746
2046	678	713	749	787	827	870	914	961	-1505	0	4994	8590	0.784
2047	678	713	749	787	827	870	914	961	-1380	0	5119	8920	0.796
2048	678	713	749	787	827	870	914	961	-1207	0	5291	9341	0.815
2049	678	713	749	787	827	870	914	961	-256	-822	5421	9695	0.826
2050	678	713	749	787	827	870	914	961	567	-1447	5619	10178	0.848

Table 8. Calculation of welfare effect of ongoing policy, pessimistic displacement case

Discount rate (r)	3	5	7	7.759	8.520	10	15
Equivalent percentage deviation in household consumption in 2003, ignoring benefits beyond 2050	3.73	1.39	0.26	0.00	-0.20	-0.46	-0.74
Equivalent percentage deviation in household consumption in 2003, including benefits beyond 2050	10.26	2.98	0.73	0.30	0.00	-0.37	-0.73

implementation would be worthwhile. Even under the pessimistic displacement assumption, the ongoing policy is likely to generate a high rate of return. Our calculations suggest an internal rate of return of between 8 and 10 per cent.

Appendix 1: present value calculations

AE calculates the present value of their program with a 5 per cent discount rate as $8.18 billion (AE, Table S1). Taking account of our omission of "benefits to employers" [see note (f) to Table 1], and applying the AE methodology, we obtain $6.7 billion as the present value of the AE program. This number can be calculated by taking the present value with a 5 per cent discount rate of the stream of net benefits in the program A column of Table 5.

However, our present value methodology used in Tables 6 and 8 is different from AE's. Instead of discounting a stream of absolute dollar numbers, we discount a stream of *percentage deviations* in consumption. As can be seen from the program A column in Table 5, we assume that the dollar benefits (2002 prices) of the AE program are constant at $829 million for each year from 2011 to 2050. (Beyond 2050 program A produces no benefits.) We inflate the $829m to allow for real wage growth but not for population growth (there is no growth in the number of beneficiaries from program A). Thus, the significance of the $829m in causing *percentage deviations* in private consumption gradually declines (at about the rate of population growth of 1 per cent). Taking this into account we find that the present value of AE's program A (with the exclusion of the benefits to employers) is $4.9 billion. If we consider an ongoing project, then we can assume that the benefits are equivalent to a stream of $4.9b in 2003, $4.9b in 2008, $4.9b in 2013, to infinity. This stream at 5 per cent discount has a present value of $22.6 billion.

The MONASH calculation in the 5 per cent column of Table 6 for the program that goes to infinity implies a present value of $19.3 billion (= 0.0464*415, consumption in 2003 is forecast to

be $415 billion). The discrepancy between the $22.6b and the MONASH model result of $19.3b can be attributed to factors taken account in the MONASH model that are not included in the AE calculations. These factors include: short-run unemployment caused by tax increases and wage stickiness at the beginning of the policy; and changes in factor prices favouring capital (which is partially foreign owned) relative to labour (which is fully Australian owned).

Appendix 2: the MONASH model

MONASH is a dynamic computable general equilibrium model of the Australian economy developed at the Centre of Policy Studies, Monash University. The model is designed for forecasting and policy analysis. It describes in mathematical terms the behaviour: of industries, households and the government; of domestic and foreign markets for commodities; and of the domestic markets for labour and capital. The parameters of the mathematical description are estimated mainly from published and unpublished data supplied by the Australian Bureau of Statistics. The model generates results for 112 industries and 115 commodities.

MONASH has been applied in numerous forecasting and policy exercises. In forecasting, MONASH is used on a continuing basis by State and Commonwealth government departments to generate detailed employment projections. In policy analysis, the model has been used to look at: the effects of changes in tariffs on motor vehicles and on textiles, clothing and footwear; the effects of the adoption of eCommerce; the effects of reforms in the coal industry; the role of water in the Australian economy; the effects of reductions in waterfront costs; the implications of a more open airline policy; the implications of financing, by different types of taxes, a major project such as the undergrounding of electricity and communication cables; the effects of a reduction in the number of foreign students coming to Australia caused by the Asian economic slowdown; and the effects of the GST.

MONASH is fully documented[10] and is regularly assessed in the refereeing processes of leading economic journals.

[10] See Dixon, P.B. and M.T. Rimmer (2002), *Dynamic General Equilibrium Modelling for Forecasting and Policy: a Practical Guide and Documentation of MONASH*, North-Holland Publishing Company.

Chart 1. Real GDP and factor inputs: central case
(% deviations from basecase forecasts)

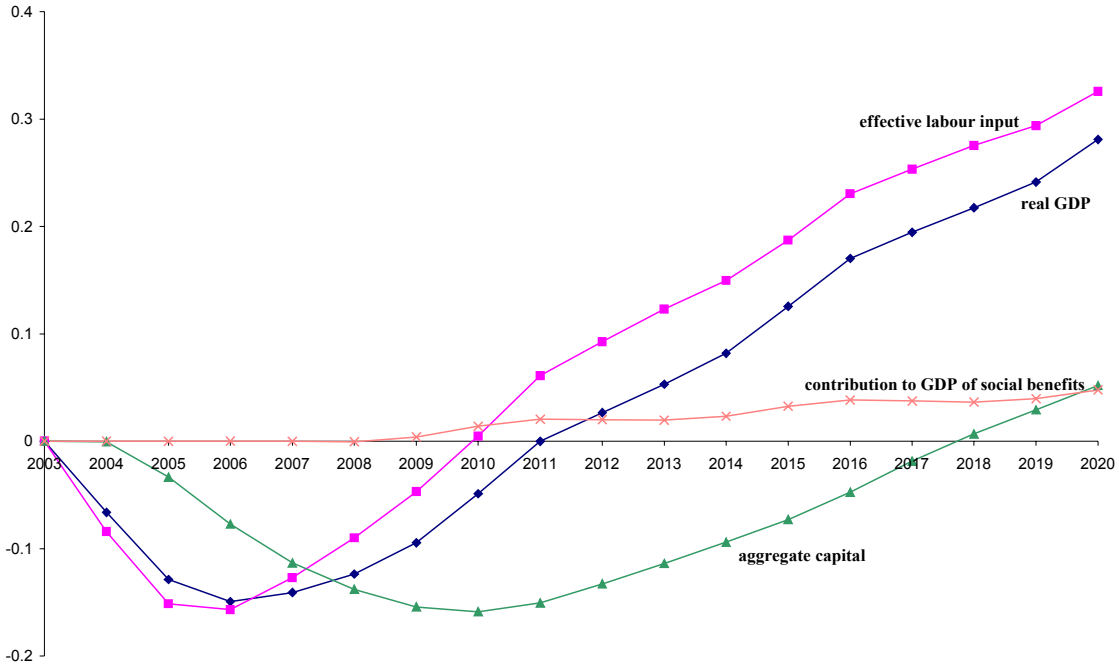


Chart 2. Real GDP, investment and private & public consumption: central case
(% deviations from basecase forecasts)

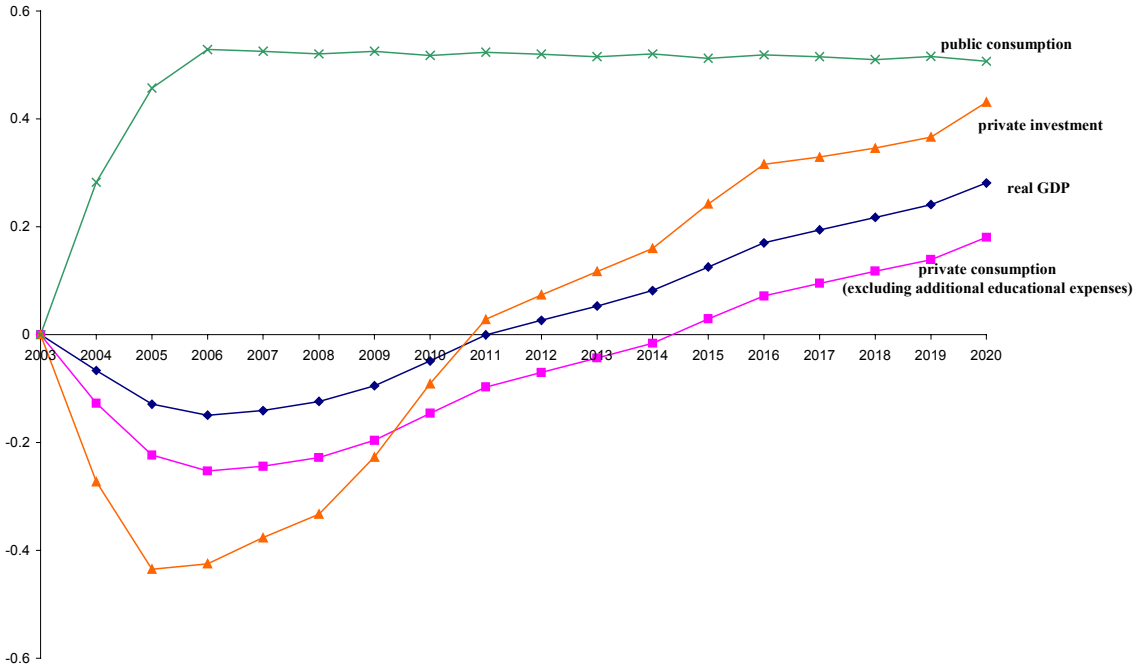


Chart 3. Aggregate export and import volumes: central case
(% deviations from basecase forecasts)

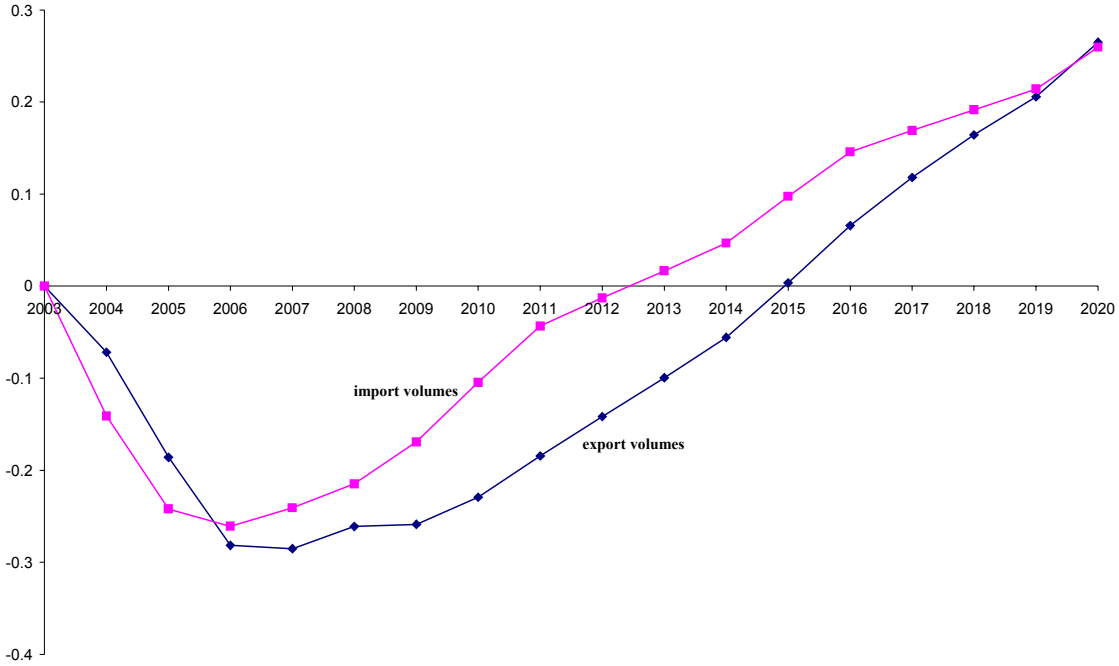


Chart 4. Real exchange rate (positive means appreciation): central case
(% deviations from basecase forecasts)

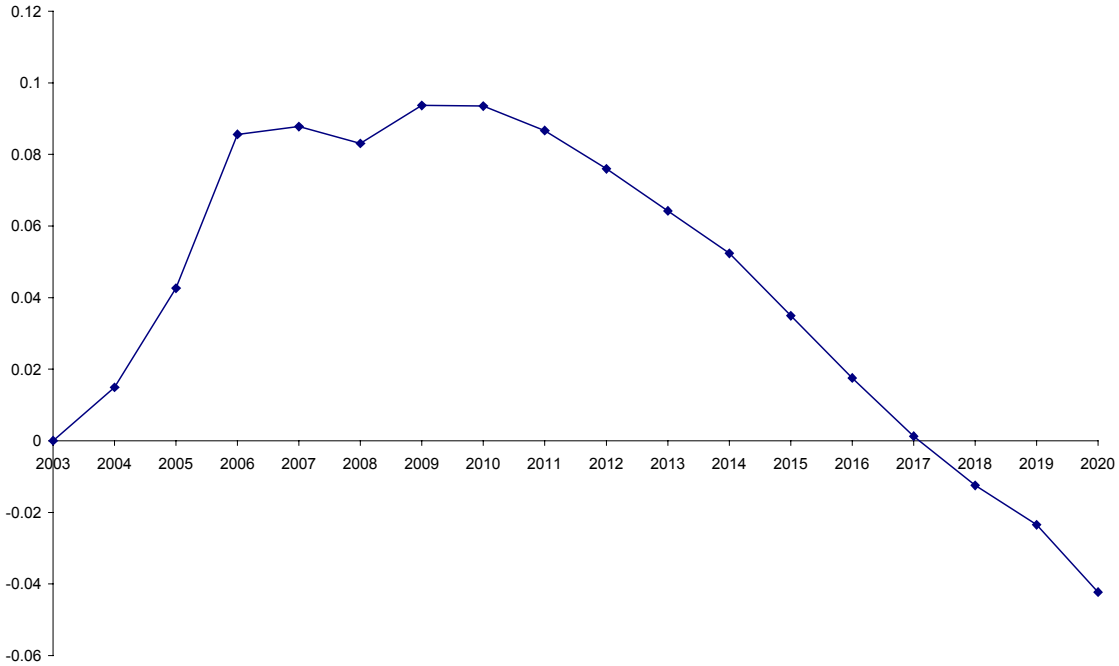


Chart 5. Terms of trade: central case
(% deviations from basecase forecasts)

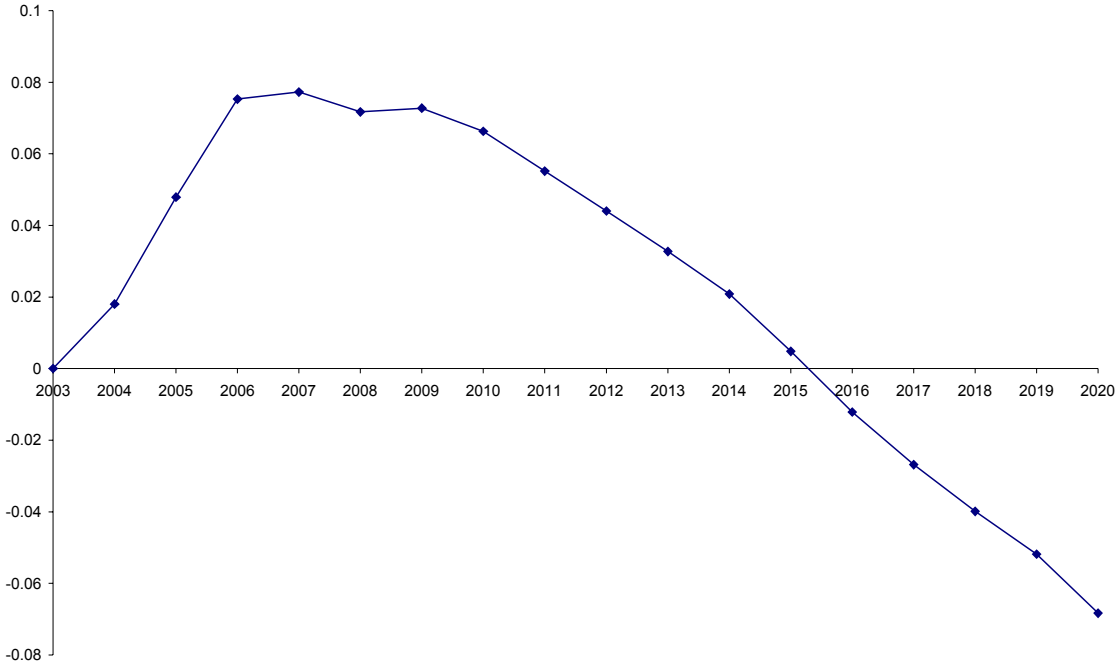


Chart 6. Direct benefits and private consumption: central case
(% deviations from basecase forecasts)

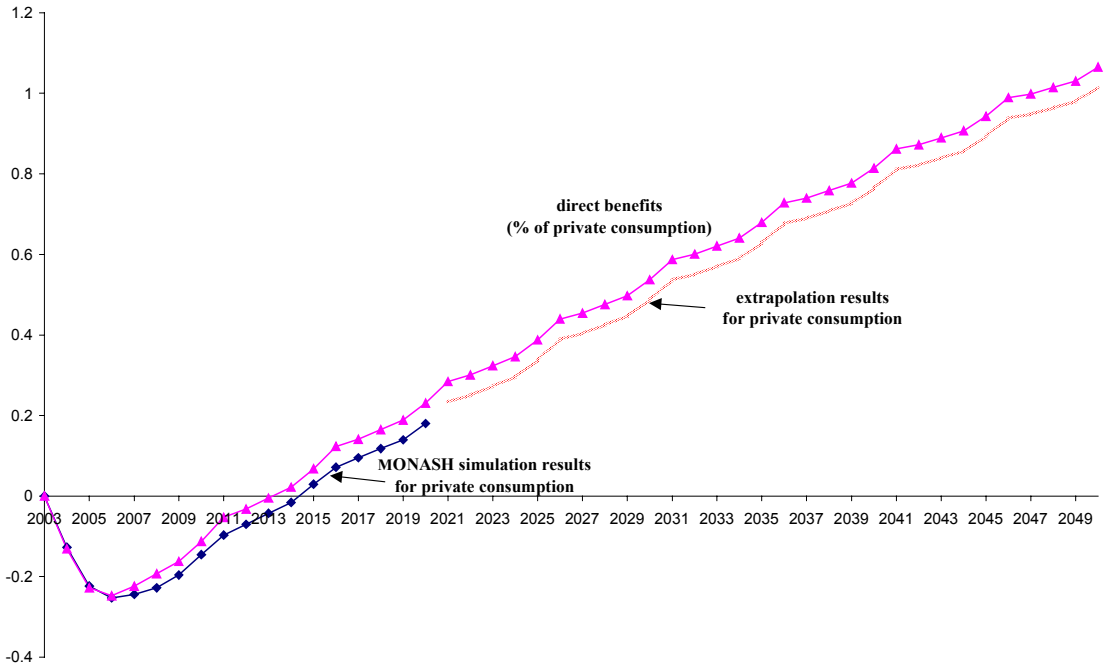


Chart 7. Direct benefits and private consumption: pessimistic displacement case (% deviations from basecase forecasts)