15 The implications of ageing for education policy

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15.1 Introduction

The ageing of the Australian population over the next 50 years suggests that public spending on education will decline as a proportion of gross domestic product (GDP) (see papers by Johnson and Creedy in this publication). However, historical data and assumptions underlying such projections do not allow for a number of competing influences on education spending which could limit this projected decline — not least, barriers to reallocation between sectors within the education portfolio due to the structure of responsibilities across different levels of government. Further, population ageing has given rise to concerns about economic growth, and the distribution of resources and investments in education provide one of several policy alternatives for alleviating these concerns. Depending on their nature, therefore, changes to education policy could arrest or even reverse the projected decline in public expenditure on education as a proportion of GDP.

This paper considers both macroeconomic and microeconomic issues related to population ageing and the implications for education policy (see also Mason and Randell 1997).

From a macroeconomic perspective, one of the principal factors driving concerns about population ageing relates to the projected rise in the economic dependency ratio[2] (Bacon 1997; Creedy 1998; simulations in section 15.2 of this paper for

[1] The views expressed in this paper are those of the staff involved and do not necessarily reflect those of the Productivity Commission. The authors gratefully acknowledge the assistance and advice received from the Commonwealth Treasury's Retirement Income Modelling Unit in carrying out the simulations presented in this paper. The authors have also benefited from comments by two Commission referees and discussions with their colleagues. However, any remaining errors are their own.

[2] Henceforth abbreviated as EDR and defined as the ratio of persons not working to employed (full time and part time) persons aged 15–64, expressed as a percentage.

estimates). This implies that fewer workers will be available to produce goods and services for the population as a whole. The fairly predictable nature of demographic change — even if net migration is included — means that a fall in the proportion of persons aged 15–64 in the population is not seriously in question (see appendix B). Economic changes, by contrast, are inherently more unpredictable. However, if present trends are indicative of future conditions, lengthening periods of education, earlier retirement and falling overall labour force participation rates will also contribute to a decline in the share of employed workers in the population.

Projections by the Organisation of Economic Cooperation and Development (OECD) suggest that such a decline could be detrimental to Australia's economy, in the form of a slowdown in the rate of growth of GDP per capita (OECD 1998a). This slowdown is primarily attributed to a slowdown in labour force growth due, in part, to a continuation of the trend towards early retirement. A compounding factor mentioned by the OECD is a slowdown in labour productivity growth, caused by lower capital intensity, itself the result of a decline in the national saving rate and hence, investment in physical capital. Finally, the OECD (1998a) predicts that population ageing will lead to a deterioration in public finances, as the weight of social expenditure (pensions, health, aged care) in the budget increases significantly.

One form of investment — human capital investment — has the potential to moderate some of the negative effects that have been predicted to occur as a result of population ageing. Following human capital theory (Becker 1964), education and training are thought to improve an individual's skills and thus their productivity. Further, individual labour force participation rates and retirement age increase with educational attainment. Thus, education and training may alleviate the detrimental effects of the labour force growth slowdown on GDP per capita growth. In addition, they may alleviate the predicted deterioration in public finances by lessening the need for social transfers in old age. This would occur if higher levels of education enabled future retirees to exercise greater claims on future output (for example, through the ownership of assets or property rights). In this sense, additional investments in self-education may provide people with a kind of 'retirement self-insurance'.

From a microeconomic viewpoint, population ageing may affect private incentives to invest in education and market failures traditionally associated with education and training. Ageing may also give rise to other types of market failure. Such failures may imply that greater than anticipated public expenditure on education will be necessary.

Overall, therefore, there are some reasons to question the *a priori* expectation that public expenditure on education will necessarily fall as a percentage of GDP as a

result of population ageing. However, ageing may also generate pressures for increases in public expenditure more generally (see, for example, the paper by Creedy and the paper by Howe and Sarjeant in this publication), highlighting the need to consider public expenditure on education in the context of competing demands for public funds across the government as a whole.

The objectives of this paper are twofold. First, the paper sets out to assess the potential for increases in educational attainment to alleviate any possible negative effects of population ageing on overall economic welfare. While such a policy would entail increases in public expenditure, only the benefits of such an approach are considered in section 15.2. That section contains a range of simulations that examine, other things held constant, the effects of improving educational attainment on the economic dependency ratio (EDR), labour productivity and income growth over the next 50 years. Second, in section 15.3, the paper seeks to examine the impact of population ageing on private incentives to invest in education and the likelihood of market failures arising. Some implications for education policy and public expenditure on education, as well as policy issues for related portfolios are then discussed. Another form of private human capital investment — that by an older cohort in the education of a younger cohort (see the paper by Dowrick in this publication) — is not considered in this paper. Key conclusions are drawn in section 15.4.

15.2 Educational attainment and economic outcomes

As mentioned earlier, a major concern raised in the context of population ageing is that of a lower aggregate growth performance of the economy. Yet, as Dowrick argues in this publication, this need not translate into a decline in output per capita growth if one or more of the following changes occurs: (i) population growth declines even more than output growth; (ii) saving, physical investment and labour productivity increase; (iii) labour force participation increases; and (iv) investment in human capital increases. The last point specifically is investigated in this section, although it bears a strong relation to points (ii) and (iii).

The traditional view of a rise in the EDR is that claims on the output of workers (the younger cohort) arising from the consumption of non-workers (the older cohort) may have negative repercussions on saving, investment and growth. However, this may not eventuate if the younger cohort is more productive as a result of physical capital bequeathed by the older cohort, or increased investment in its own human capital. In either instance, the younger cohort would be better able to meet the claims on output of the older cohort without being worse off in terms of its own consumption and investment possibilities. Further, if human capital deepening

results in greater labour force participation and employment rates, three out of the four sufficient conditions for continued output per capita growth (mentioned earlier) will be met.

This said, the education–productivity link underpinning human capital theory is not entirely clearcut (see EPAC 1993 for a review of the literature). Signalling theory suggests that education does not improve the productive capacity of individuals but assists employers in assigning people to jobs by signalling innate ability. In this case, increasing educational attainment for an entire cohort will not improve job prospects and earnings across the board. Greater levels of educational attainment — beyond that required as a signal — would simply be a waste of resources.

Nonetheless, the economic importance of education has been given renewed prominence in the 'new growth theory' (Romer 1990). This theory emphasises the role of the education–knowledge–technological change–productivity chain in explaining long run economic growth. In brief, education promotes productivity and growth directly and indirectly: the direct effect is due to the addition to the stock of human capital, while the indirect effect stems from the contribution that human capital makes to the stock of knowledge.

The view that education and training contribute to employability and productivity underlies the simulations presented in section 15.2.2. Background information on educational attainment in Australia is provided in section 15.2.1.

15.2.1 Background

The correlation between educational attainment, labour force status and income in Australia is summarised in table 15.1. It shows that:

- the likelihood of being employed full time greatly increases with educational attainment. This is true for both genders and for all age groups (grouped age data not shown); and
- gross income from all sources is greatest for those with higher levels of educational attainment. Again, this is true for both genders and for all ages. Subject to the above caveat about signalling, this higher income could reflect greater productivity.

Increasing educational attainment may therefore help restrict the predicted slow-down in economic growth, through increased employment rates and greater labour productivity during the working life. In addition, a greater overall level of income means a larger tax base, hence making it easier for governments to raise the funds necessary to meet the greater level of social expenditure thought to be required by an ageing population. Finally, the higher value of lifetime income achieved by educated workers may improve their ability to be self-funded in retirement, thus reducing the demand for pension income.

The numerical simulations in section 15.2.2 use these correlations to examine the impact of greater educational attainment on the economy. Previous research has also identified several other correlations between education and labour market performance. These include:

- the greater educational attainment, the greater labour mobility (ABS 1998), which may increase labour market flexibility and reduce unemployment;
- the chances of re-entering the labour market at some stage following an initial retirement increase with education. High educational level and professional skills are the strongest predictor of post-retirement employment (Wolcott 1998);
- the more educated a person is initially, the greater the likelihood that he or she will undertake training on a regular basis during his/her working life, thus reducing the likelihood of skill atrophy, unemployment and early retirement (Groot 1997; Hight 1998; OECD 1998a); and
- the more educated parents are, the more educated their children, on average (see OECD 1998b, p. 48). Also, the more educated a firm's manager, the more likely

Table 15.1 **Educational attainment, full time employment and income**

Civilian population aged 15–64, Australia

	Females		*Males*	
	Employment[a]	*Income*[b]	*Employment*[a]	*Income*[b]
Educational attainment	1997	1996	1997	1996
	%	$	%	$
Degree or higher[c]	56	765	83	983
Diploma[c]	45	620	79	820
Vocational[c]	38	510	79	659
No qualifications[c]	25	487	57	587

[a] Proportion employed full time. [b] Gross weekly income from all sources in 1996 of those in full time employment. [c] 'Degree or higher' includes bachelor degrees, higher degrees and postgraduate diplomas; 'Diploma' includes associate and undergraduate diplomas; 'Vocational' includes skilled and basic vocational qualifications; 'No Qualifications' refers to persons without post-school qualifications (but includes those attending educational institutions).

Data sources: ABS (unpublished Census data 1996; unpublished Labour Force Survey data 1997).

the firm's employees are to undergo training.

These correlations are not able to be modelled in the present simulations. They would nonetheless add to the beneficial impact of greater educational attainment on the economy and welfare generally.

Educational attainment in Australia

The highest level of educational attainment by age and gender is shown in figure 15.1 in four successive periods from 1984 to 1997. Several changes are apparent, particularly an increase in the share of those with degree or higher qualifications, away from other types of post-school qualifications. This has been especially true of the period 1993–97 and for males. Overall, there has been little or no variation in the proportion of the population without any post-school qualifications in each age group, particularly during the 1990s. This is not to say that Australia's human capital is not increasing. Technically, changes illustrated in figure 15.1 must stem from a combination of: (i) people increasingly choosing to enrol in degrees or higher *instead of* diploma or vocational qualification courses; and (ii) people 'upgrading' their qualifications from diplomas, say, to degrees. Both types of change should imply an increase in human capital.

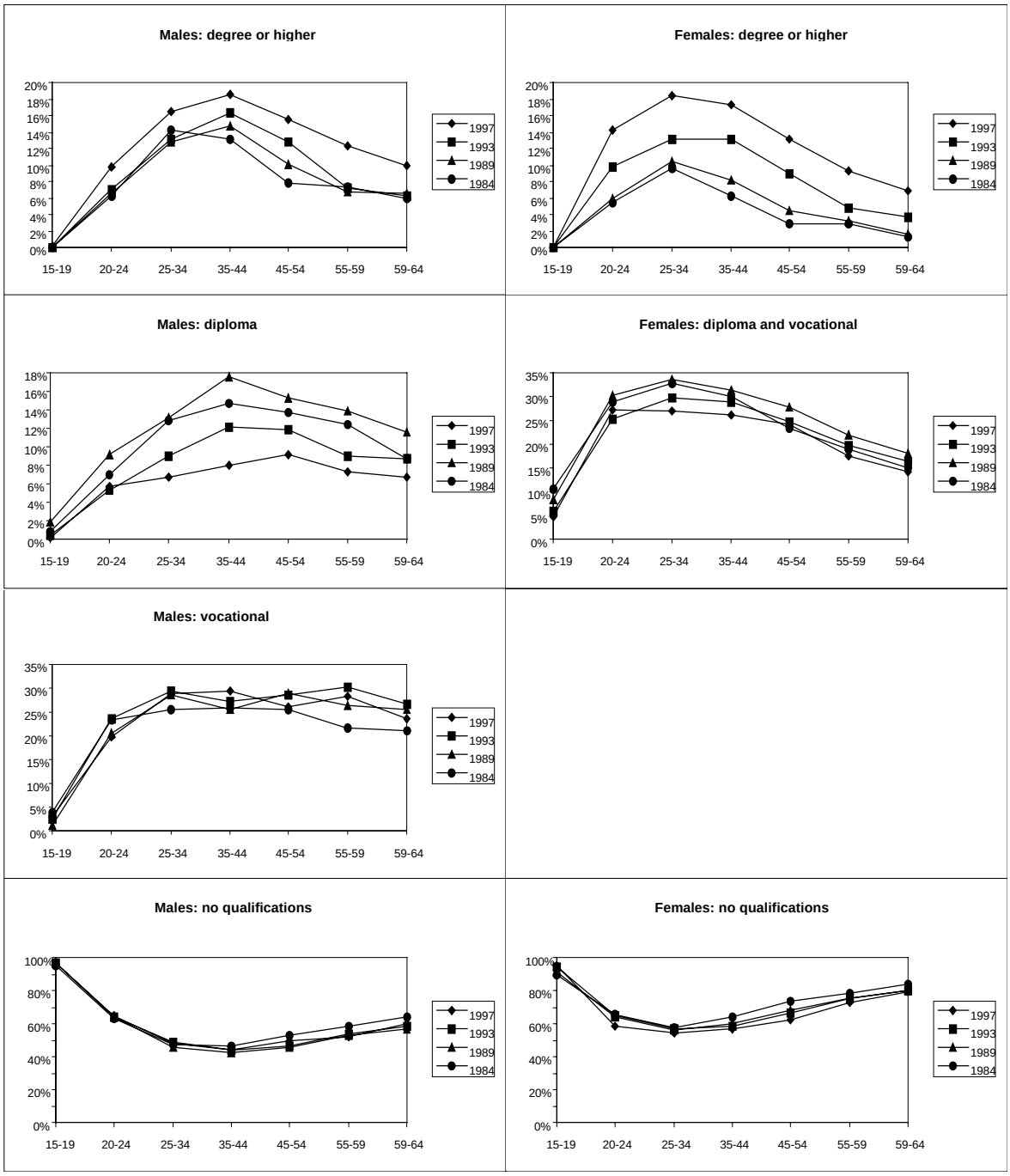
On a related point, if more high school students are opting to complete year 12 rather than undertake vocational training after year 10, human capital accumulation is underestimated in the taxonomy used here. This is because students ending their schooling after year 12, despite having typically undergone more schooling than their counterparts with basic vocational qualifications,[3] are deemed to be less qualified. In reality, these students may have acquired similar skills (for example, keyboarding) to their vocational counterparts, which is why the OECD puts both groups into the same 'upper secondary education' category (OECD 1998b).

Nonetheless, educational attainment in Australia lags behind some OECD countries. In the US, for instance, 26 per cent of the civilian population aged 15–64 hold degree or higher qualifications, while 52 per cent hold vocational qualifications (OECD 1998b). Equivalent figures for Australia are 15 per cent and 32 per cent respectively. In Canada, 31 per cent hold diploma qualifications, while this figure is only 10 per cent in Australia. As the US and Canada are the OECD leaders in the categories mentioned, the gap between Australia's experience and what may be termed 'world best practice' is clear.

[3] These require six months to one year of full time study or equivalent.

However, this relative attainment gap experienced by Australia may decrease in future due to the significant increase in participation in education and training

Figure 15.1 **Highest educational attainment, by age[a] and gender[b], (per cent)**



a Educational attainment data for persons aged 65 and over are unavailable. **b** Data for Diploma and Vocational attainment of females have been aggregated to avoid definitional problems arising from the 1993 adoption of a new Classification of Qualifications by the ABS. As some diplomas undertaken by females prior to 1993 were subsequently reclassified as certificates, the pre- and post-1993 series are not comparable.

Data source: ABS (unpublished Labour Force Survey data).

during the 1990s. From 1989 to 1997, the number of students taking part in higher education and vocational education and training (VET) increased by 49 per cent and 57 per cent respectively (ABS cat. no. 6278.0; DETYA, unpublished data; NCVER, unpublished data). There may, however, be reasons why greater participation will not lead to commensurate increases in educational attainment. While these are outside the scope of this study, they include lower completion rates and increased non-degree enrolments.

15.2.2 Simulations

The numerical simulations presented in this section are only illustrative, due to the large number of underlying assumptions and the length of the timeframe involved. Further, the simulations rely on projections, rather than on forecasts. That is, they are based on the extrapolation of existing statistical trends, with no attempt made to incorporate behavioural relationships into the analysis. In the event of unforeseen behavioural changes, entirely different results could ensue. However, since the effects of ageing are commonly encapsulated in numerical indicators — the EDR, the labour force participation rate, etc. — it is important to try and quantify the effects of greater educational attainment in this area.

The transparency of any economic projection rests on a statement of:

- the state of play at the beginning of the projection period;
- the nature and size of the drivers of change; and
- the mechanism through which these drivers are thought to affect the simulated variables.

These points are addressed below, while further details can be found in appendix 15A.

In this paper, the state of play consists of the levels of educational attainment achieved in 1997 and the associated labour force status and income levels. A subset of these data is provided in table 15.1. The complete data set is drawn from unpublished data from the ABS Labour Force Survey.

The key assumption underlying the simulations is that the likelihood of being employed (full time and part time), unemployed, or not in the labour force for each of the four levels of educational attainment (as well as age and gender) retain their 1997 values in future. For example, the proportion of females aged 45–54 with degrees or higher who are not in the labour force was 12 per cent in 1997 (data not shown) and is assumed to remain constant over the entire projection period. These

1997 labour force status proportions are then applied to the changing age and gender structure of the population between 1997 and 2047, at five yearly intervals.

Demographic change is therefore the main driver of the simulations results. In addition, a range of hypothesised changes in the rates of educational attainment by age group are simulated. They are summarised briefly below. Detailed underlying assumptions are provided in appendix 15A. The six simulations are:

- *simul1* — this is a 'baseline' simulation, which measures the change in the EDR and associated variables when educational attainment rates by age group and gender retain their 1997 values. This is equivalent to assuming that all age cohorts from 1997 perform in the same way in regard to their acquisition of educational qualifications. The result is a 'natural increase' in overall educational attainment, because relatively less educated cohorts are being progressively replaced by better educated ones;[4]
- *simul2* — this simulation attempts to measure the effects of Australia reaching world best practice in terms of the proportion of its population with degree or higher qualifications. In practice, this means emulating the US value of 26 per cent;
- *simul3* — this represents a more ambitious simulation of world best practice, which assumes, in addition to the improvement simulated in *simul2*, that the combined proportion of the civilian population aged 15–64 with diploma or vocational qualifications also reaches that observed in both Canada and the US, which implies an increase of 42 per cent in the relevant attainment rates (see appendix 15A);
- *simul4* — in this simulation, an attempt is made to measure the effects of qualification 'upgrading' — that is, the systematic promotion of 10 per cent of holders of a particular type of qualification (except degree or higher holders) to the next higher level. This upgrading is assumed to affect age groups up to the peak age group (inclusive) only. This scenario means, for instance, that 10 per cent of persons aged 25–34 with no qualifications will now hold a vocational qualification;
- *simul5* — in this scenario, the effects of so-called 'second chance' education are considered. This scenario takes the form of qualification upgrading of the magnitude described above, but now targeted at persons aged 45 and over only; and

[4] This process can be understood by reference to the top left hand side panel of figure 15.1. Given a 18.6 per cent rate of degree or higher attainment for males aged 35–44 in 1997, the comparable rate for males aged 45–54 in 2007 will be at least 18.6 per cent (see appendix 15A for details).

- *simul6* — this simulation is intended to measure the effects of a policy consisting of the retraining of older (aged 45 and over) unemployed workers with no post-school qualifications. It is assumed that 10 per cent of such workers acquire vocational qualifications in each five year period.

Finally, the mechanisms through which the hypothesised changes affect the variables of interest are as follows. As the age and gender structure of the population changes, the educational attainment structure changes endogenously with it (*simul1*). In addition, as described above, exogenous changes in educational attainment are introduced in simulations 2–6. The combination of demographic change and educational attainment 'shocks' alters the breakdown of the overall population between the four labour force states. To retain the example used earlier, if the number of females aged 45–54 expands, so will the number holding degree or higher qualifications, as will the number who are not in the labour force. Thus, the population of each possible sub-grouping (32 in total) can be calculated for each five year period between the base and horizon years. Results are then aggregated for the population as a whole to arrive at total employed, total unemployed, etc. From these aggregate figures, the EDR can be calculated (see appendix 15A for details of the methodology).

Further, since each possible sub-grouping is associated with a specific level of income per head (in 1996 dollars), knowledge of these populations allows the calculation of income accruing to the entire civilian population aged 15–64. This then allows the calculation of income per worker and income per head figures for that population. Further, by assuming a constant 1996 income per head for the population aged 65 and over in future periods, income per capita for the entire population can be estimated as well.

Simulation results

The main results of the simulations are summarised in table 15.2.

Simul1 (the baseline scenario) shows that, over time, the proportion of the working age population with post-school qualifications increases from 40 per cent in 1997 to 46 per cent in 2047, on the strength of better educated cohorts passing through the relevant age groups. In the present model, this has a number of flow-on effects, such as a reduced unemployment rate and a greater proportion of full time workers. Further, the fall in the labour force participation rate associated with population ageing is cushioned by the greater proportion holding post-school qualifications. In spite of this, the EDR increases by 26 percentage points, from 122 to 148. This means that the natural increase in educational attainment simulated here cannot prevent the rise in the number of non-workers relative to workers. It can, however,

moderate it in the sense that a ratio calculated without reference to increasing attainment would necessarily be higher than in *simul1*, other things equal.

This moderating effect is even more in evidence in the two world best practice scenarios (*simul2* and *simul3*). The assumed proactive education policies result in a sizeable reduction in the EDR relative to *simul1*, particularly in the case of *simul3* (down from 148 to 140 or 136). This beneficial result is brought about by the combination of lower unemployment rates and higher labour force participation rates. These changes are the direct consequence of a much greater proportion of the population holding post-school qualifications (67 per cent in *simul3*, against 46 per cent in *simul1*).

The benefits of achieving world best practice are only partly reflected in the

Table 15.2 **Simulation results**[a]

		Initial[b]	*Simul1*	*Simul2*	*Simul3*	*Simul4*	*Simul5*	*Simul6*
	Unit	*1997*	*2047*	*2047*	*2047*	*2047*	*2047*	*2047*
Labour force characteristics (of population aged 15–64 except where otherwise stated)								
Population (total)	'000	18 482	24 726	24 726	24 726	24 726	24 726	24 726
Labour force	'000	9129	10 863	11 163	11 310	10 993	10 968	10 868
Employment	'000	8331	9961	10 308	10 488	10 099	10 066	9965
Part time	'000	2130	2540	2574	2593	2545	2576	2542
Unemployment	'000	798	902	856	822	894	902	902
NILF[c]	'000	3189	4088	3832	3641	3957	3983	4083
LFPR[d]	%	74.1	72.7	74.4	75.7	73.5	73.4	72.7
UNEMPR[e]	%	8.7	8.3	7.7	7.3	8.1	8.2	8.3
%Q[f]	%	40.4	45.7	55.4	67.4	51.4	50.2	46.0
%Pt[g]	%	25.6	25.5	25.0	24.7	25.2	25.6	25.5
Economic dependency ratio[h]	%	122	148	140	136	145	146	148
Income[i] *variables*[j] (Percentage change over 1997 value)								
Income (15–64) / pop (15–64)[k]	%		2.2	10.1	12.6	4.1	4.2	2.3
Income (total) / pop (total)[l]	%		2.3	8.8	10.9	3.8	3.9	2.3
Income (15–64) / EMP (15–64)[m]	%		3.8	8.1	8.6	4.2	4.7	3.8

[a] The results presented in this table are illustrative only and are not forecasts. [b] Initial (1997) figures are the same for all scenarios. [c] Not in the labour force. [d] Labour force participation rate. [e] Aggregate unemployment rate. [f] Percentage of the civilian population aged 15–64 with post-school qualifications. [g] Percentage of employed persons working part time. [h] Calculated as {[population (total) – Employment (15–64)]/employment (15–64)}. [i] Gross average weekly income from all sources. [j] Indicators of living standards. [k] Income accruing to the population aged 15–64 divided by that population. [l] Income accruing to the total population (estimated by assuming a constant 1996 income per head of population over 65) divided by that population. [m] Income accruing to the population aged 15–64 divided by employed workers in that population.

Source: PC estimates.

moderating influence that greater educational attainment exerts on the proportion of non-workers to workers. In addition, as the bottom part of table 15.2 shows, economic performance is positively influenced by an increase in educational attainment. In both *simul2* and *simul3*, income per employed worker and the two measures of income per head increase significantly more than in *simul1*. This may be interpreted as average labour productivity rising with educational attainment, thus allowing income per head estimates to exceed those in *simul1* by 6–10 percentage points, depending on the simulation and the definition of the population chosen (table 15.2). In practical terms, this is equivalent to a gain of between $21–$46 (in 1996 dollars) per week and per person over the baseline case.

The remaining simulations confirm the capacity of greater levels of educational attainment to moderate the rise in the EDR, to enhance labour productivity and to increase income per head. Depending on the type of policy envisaged, these benefits are more or less pronounced. Second chance education (*simul5*) has the most favourable effects of the remaining simulations, closely followed by qualification upgrading (*simul4*). In contrast, retraining (*simul6*) in the format assumed here has no significant impact on the economy. However, direct comparisons between policies are not possible, since the cost of their implementation is certain to differ. This issue is discussed in section 15.3.

Conclusion

The simulation results suggest, *all else equal*, that increases in educational attainment may be able to moderate somewhat the effects of population ageing on the standard of living of all Australians. The most favourable results are those of *simul2* and *simul3*, which see Australia reach parity with world leaders in terms of educational attainment. If rates of educational attainment observed in North America were able to be emulated, and if the 1997 labour force status proportions attached to the various qualification (as well as age and gender) groups were maintained in future, employed workers would become relatively more numerous and more productive, thus cushioning the negative effect of population ageing on the growth in income per head predicted by some authors (OECD 1998a). In practical terms, achieving the attainment rates of *simul3* would be equivalent to postponing the rise in the EDR by approximately 20 years.

The next best simulations — *simul4* and *simul5* — also suggest the existence of benefits flowing from improved educational achievement, albeit of a smaller order of magnitude. By contrast, *simul6* entails negligible benefits only. This is consistent with other assessments of the employment prospects of older workers, should they gain vocational qualifications (OECD 1998a). This, and the more general issue of retraining of older workers, will be examined in greater detail in the next section.

Finally, overall results must be put in perspective. If the whole array of factors influencing labour force participation, unemployment and labour productivity is allowed to vary and to interact, different results emerge. The OECD (1998a) for example, predicts an unemployment rate of 5 per cent from 2005 and an average growth rate in real GDP per capita of about 1 per cent per year over the period 2010–40. Thus, the income per head of Australians by the middle of the next century is certain to be significantly higher than implied in table 15.2. Nonetheless, the simulations in this section have shown that greater educational attainment could contribute to this improvement.

15.3 Implications of ageing for education policy

The results in the previous section raise the issue of whether or not education policy should aim to further encourage investments in education as a response to population ageing. However, policy implications should not be drawn from these simulations alone for several reasons.

First, the simulations underestimate the actual effect of education on the chosen indicators of wellbeing, partly because they do not account for the connection between education, training and economic growth or allow for labour force participation by those aged over 65. In addition, the simulations do not consider the fact that investments in education are costly, involving reductions in potential output while individuals study (when they could otherwise be at work), and because education itself uses up scarce resources. These costs must be taken into account in measuring the economy-wide benefits of further investments in education.

Second, the EDR is only an indicator and is not a measure of economic wellbeing. As discussed previously, it is possible that productivity could increase even though labour supply falls. Hence, an increase in the EDR does not necessarily imply a worsening of living standards. The EDR should not therefore drive changes in education policy. Any change to education policy should be aimed primarily at improving social equity, productivity and economic growth.

Third, while education is a significant policy instrument for generating improvements in productivity and economic growth, many others exist. The relative merits of all policy instruments should be assessed before choosing any particular approach.

Consequently, determining whether or not governments should further encourage investments in education (in addition to policy measures already in place) in response to population ageing is a complex issue, requiring judgments about the

importance of educational attainment for economic growth and whether public funds could be allocated elsewhere with correspondingly higher economy-wide net benefits.

Current government action (via taxation policy and direct subsidies) is based on the view that individuals and firms — if left to their own resources — will underinvest in education and training because of market failures. It also relates to the connection between education and economic growth and the importance of education for social equity. For ageing to justify further action or changes to current policies, it would have to exacerbate these underinvestments due to market failure, or create other problems that could be addressed directly through education policy. Even if this were the case, the costs of government intervention may limit its usefulness in practice. In addition, population ageing may generate incentives for individuals and firms to invest more in human capital of their own volition, without any encouragement by governments.

Section 15.3.1 therefore canvasses the impact of ageing on investments in education and training by individuals or firms, assesses whether ageing adds to pre-existing reasons for underinvestments due to market failure and, in the process, explores whether ageing introduces other reasons to believe that investments in education may be inadequate. Some implications for government policy arising from the analysis in section 15.3.1 are drawn in section 15.3.2.

15.3.1 Implications of ageing for investments in education

Predicting the impact of ageing on incentives to invest in education

The human capital framework facilitates insights into the impact of population ageing on private investments in education and training by highlighting the factors that affect the incentives surrounding decisions to invest. According to human capital theory, decisions to undertake education or training are akin to decisions to invest in physical infrastructure. Such decisions by both individuals and firms will depend on a comparison of the future benefits arising from the investment and its current costs. The net return is then measured against other possible courses of action.

Human capital theory suggests that two critical determinants of educational investment decisions are the time period over which returns to education and training can be recouped, and expectations about the net returns to skill development (for the individual in the form of the addition to future earnings, and for the firm in the relationship between productivity and wage changes).

Turning to the recoupment period first, if the impact of population ageing is considered alone and all other factors are held constant, expectations of lengthening life (which are part and parcel of population ageing) may favourably affect individual incentives to make initial investments in education and training. However, this hypothesis may not hold if expectations regarding length of life are not correlated with expectations of length of working life or, more specifically, skill-specific recoupment periods. This may be the case if an individual's skills atrophy at a rate that deems educational investments worthless before the end of an individual's working life, or if instead of using their longer life span to work for a longer time period, individuals take time out from the workforce for family care or leisure, for example.

Similarly, other things held constant, the period during which firms can recoup training expenditure per employee may expand if population ageing is somehow correlated with an increase in expected job duration. The OECD (1998c) suggests the five-year retention rate for older workers (aged 45 and over) is higher than that for younger workers in six of the nine countries for which data are available. In addition, ABS data suggest that worker mobility tends to decline with age.[5] On the other hand, the OECD (1998c) data also suggest that younger workers in most of the countries studied appear more likely than older workers to remain with a firm for longer periods. Further, the incentives of firms to train their employees will diminish after a certain age as workers move closer to retirement. It is therefore very difficult to predict the impact of population ageing on the training decisions of firms. However, it is possible that if population ageing leads to a fall in worker mobility generally (because of an increase in the average age of the workforce), that firms will be more willing to finance the development of their employees' generic skills. This has implications for the extent of capital market failure as a cause of underinvestments in education by individuals (further discussed below). Overall, the relative importance of age and job duration as determining factors in skill investments by firms is open to debate. The OECD (1998c, p. 139) concludes that 'the bottom line is that little is known about how firms assess the potential life of skill investments'.

Other things held constant, the net returns to skill development may be affected by population ageing via changes in relative cohort size, with repercussions for individual incentives to invest in education. Fluctuations in birth cohort size cause fluctuations in the relative size of various labour market cohorts, where a cohort may be defined with reference to factors such as age, qualifications and work experience. Evidence suggests that earnings relativities are sensitive to changes in

[5] ABS (1998) mobility data suggest that job mobility is related to age in an inverted U-shape, increasing to the age of 20–24 as young people 'shop' for jobs, and then declining.

the relative size of labour market cohorts, with the relationship depending on the degree to which labour market cohorts are substitutable in the production process. As Connelly (1986, p. 543) noted 'empirical studies ... generally agree that a large labour market cohort has a negative effect on the earnings of individuals in that cohort'.

Where earnings relativities between more and less educated people are affected,[6] educational participation choices are also likely to change (although as Disney [1996] notes, such choices tend to be constrained by government policies controlling prices and places in the education and training market). The nature of the relationship between changes in educational participation rates and changes in relative cohort size depends on the way in which expectations about earnings are formulated. Connelly (1986) shows a range of outcomes depending on assumptions about the extent of individual's foresight about their relative cohort size and the feedback effect via relative returns to education. While it is possible with perfect foresight, that successive declines in the size of birth cohorts (which will occur with the current decline in fertility) will engender an increase in educational participation rates (Stapleton and Young 1988), but the opposite could also occur if young workers do not anticipate the feedback effect and their discount rates are high. Hence, it is difficult to predict the overall direction of this effect. Further research estimating the impact of changes in relative cohort size on educational participation in Australia would be useful.

Age may also affect the marginal cost to individuals of training, thus influencing the net returns to skill development. The OECD (1998c) notes evidence suggesting less educated workers and those not employed in a learning environment are likely to experience a decline in learning ability with age, increasing the marginal cost to them of training and providing a disincentive for them to engage in re-training. This is one factor contributing to the low skill/low training trap, where older less educated people who lose their jobs face long periods of unemployment or involuntary retirement.[7] Initial investments in education can reduce the costs to individuals of subsequent skill development. Current participation rates in continuing education and training reflect this, rising with both educational attainment and literacy skills (OECD 1998b). The OECD (1998b, p. 208) concludes that 'Skill differences that result from different levels of initial education are thus amplified by subsequent training decisions by employers and employees'.

6 There is evidence that cohort size affects more highly educated people relatively more than it does less well educated people (Berger 1983 and Welch 1979 cited in Connelly 1986).

7 Despite the unemployment rate of older people being lower than that of younger people, their comparative risk of long term unemployment is greater (see for example, OECD 1998c).

While evidence suggests that age can increase the marginal cost of training for those with little education, an increase in the average age of the population due to population ageing will not necessarily exacerbate the 'low skill/low training trap' in numerical terms. First, while it is very difficult to predict the impact of ageing on unemployment, Disney concludes that ageing related unemployment pessimism remains unproven (Disney 1996) and the OECD (1998a) predicts that ageing will reduce the Australian unemployment rate. Second, current increases in educational participation are likely to improve the educational attainment levels of older people in future. However, lengthening life spans could extend the length of time for which less skilled older workers who lose their jobs spend on low incomes.

In conclusion, even if other influences are held constant, projections of the impact of population ageing on private incentives to invest in education are extremely difficult. However, it would appear that population ageing alone is unlikely to worsen the 'low skill/low training trap' in numerical terms. While the latter is a problem of concern for policy generally, policy action is not justified from the perspective of an ageing population alone.

Market failures

There are several 'market failures' typically associated with education and training that tend to inhibit investments by individuals and firms in education and training — positive externalities, liquidity constraints and information deficiencies. The impact of ageing on these three types of market failure is analysed below. In addition, age discrimination may also lead firms to 'underinvest' in the training of older people.[8]

First, the positive externalities associated with investments in education and training (see IC 1997) are likely to be inversely related to age, simply because the time available to recoup spillovers falls as people get older. Hence, as the average age of the population increases, the positive externalities associated with investments in education fall. On the other hand, given that population ageing is partly driven by longer life expectancy, the positive externalities associated with investments in education at any given age are greater with longer average expected life spans. However, externalities also vary with other factors such as the type of education and training (for example, general or specific), the level of education and training (primary, secondary or tertiary) and the form of education and training (research or course work). Hence, for example, it is possible that the spillovers associated with an older worker completing secondary education are greater than those associated

[8]Age discrimination occurs if employers prefer young people for training over older people, even though the net benefits associated with training older and younger people are exactly the same.

with a young worker obtaining a masters degree by course work. Williams (1998, p. 155) makes the point that:

> ... externalities associated with education will be greater the earlier in life the education is received. ... with the possible exception of a research degree in which the research itself provides external benefits.

Unfortunately, little is known about the extent of spillovers generally, let alone the differences in spillovers arising from each educational sector or level (IC 1997).

Second, liquidity constraints depend on socioeconomic factors rather than age. However, older people are more likely than younger people to have built up collateral, and therefore less likely to be hampered by a lack of access to finance for investments in human capital. Thus, population ageing may reduce the prevalence of this constraint on educational investments. In addition, any increase in the willingness of firms to contribute to the cost of general training due to population ageing (discussed in section 15.3.1) may reduce the problem of capital market failure since individuals are more likely to face difficulties in accessing capital for training purposes than firms.

Third, underinvestments by individuals and firms in education and training may stem from inadequate information about the associated costs and benefits. This type of market failure is likely to affect fewer people as educational attainment increases because education tends to improve information gathering skills and, in addition, those with qualifications are likely to be familiar with the benefits of education. However, first-time investors (which may include older people in the secondary labour market) remain at risk.

Since the returns to education accrue over a long time period, lack of information about the future may mean people are unable to predict the expected value of those returns. Where this is combined with myopia stemming from a lack of information about the range of benefits associated with education (such as increased job mobility), individuals may undervalue the future returns to education (because they overestimate the risk of downward fluctuations in those returns, for example). This may result in an underestimate of the value of education as an insurance mechanism for retirement (through higher earnings, longer periods in the labour force and a lower probability of unemployment). Unemployment benefits and public pensions may lead to some moral hazard in this respect. As a result, people will tend to underinvest in education compared with a level that would provide adequately for their retirement. This could have a social cost, worsening the indicators projected in section 15.2 and adversely affecting economic growth.

Finally, age discrimination is difficult to prove, as in some cases, selection of young people for training in preference to older people may be rational. Evidence of age

discrimination is therefore scarce (OECD 1998c). Age discrimination may reflect informational deficiencies if, for example, employers believe that individuals become less productive from age 45, when there is little evidence that this is the case (Johnson and Zimmerman 1993).

In conclusion, population ageing accentuates concerns about market failure, particularly if ageing is associated with a fall in economic growth. However, according to the discussion above, the impact of population ageing on the market failures traditionally associated with education and training does not provide an obvious case for additional government intervention in the market for education and training. This is with the proviso that some policy action may be necessary if mypopia and uncertainly lead people to underestimate the value of education as an insurance mechanism for retirement, generating social costs where it leads to falls in economic growth. Further research is required to determine whether age discrimination may be of concern.

15.3.2 Issues for education policy associated with population ageing

The foregoing analysis does not reveal a strong case linked to population ageing alone for policy action to encourage individuals or firms to raise investments in education and training.

While it is possible to conceive of a scenario where economic growth falls as a result of the impact of ageing on labour force and saving — and the OECD (1998a) has predicted such a fall — Dowrick's paper in this publication suggests that concurrent falls in population growth mean that GDP per head may not be adversely affected. Further, while section 15.2 suggests benefits from increased educational attainment, without information on the costs of such an approach (and therefore rates of return), it is not possible to compare the merits of such a policy with alternatives that may also benefit economic growth (for example, additional investments in infrastructure). There may be other reasons to promote greater educational attainment generally that are not linked to population ageing — such as the gathering pace of technological change, globalisation and the casualisation of the labour force — but these are outside the scope of this paper.

In the event that governments did decide to encourage greater participation in education in response to population ageing, there are various policy approaches, many of which have been discussed elsewhere. For example, reforms to improve efficiency in the education sector (discussed by West 1998 in relation to the higher education sector), or a reduction in the fees paid by private individuals for higher education under the Higher Education Contribution Scheme (although this may not

expand investments in education if demand for higher education is relatively inelastic [IC 1997]).

Education policy approaches involving significant increases in government expenditure may be constrained by ageing-related public resource pressures, notably in the health and aged care portfolios. On the other hand, population ageing introduces scope for reallocating public funds within education. If current policies are maintained and spending per capita remains unchanged, population ageing will reduce the demand for funds in the primary and secondary sectors, but (depending on the time frame under consideration) may increase demand for relatively more expensive tertiary education. However, population ageing may also affect spending per capita. The demand for cheaper education delivery methods may rise if older age groups prefer distance or correspondence education, shorter, re-training courses and less personal contact with teachers. In practice, there is some question about whether opportunities for reallocation and savings within the education portfolio will be captured. Policy decisions in Australia relating to reallocation between sectors within the education portfolio are difficult because responsibility for education is spread across different levels of government. In addition, lags in the response of educational infrastructure to demographic change (due to geographic immobility of infrastructure, or leading, for example, to falling class sizes) (OECD 1998b) may lead to capital deepening in the primary and secondary sectors by default. Further, governments responsible for declining education sectors may take the opportunity to initiate increases in spending per capita, by increasing the use of computers in primary education for example (World Bank 1994). Lastly, the education sector may not respond to ageing-related changes in the nature of demand because of constraints on supply due, for example, to the degree of centralisation in decision making (West 1998).

Whether or not funds within the education sector are mobile in practice, population ageing does not appear to justify a switch in targeting from younger people to older people. The low skill/low training trap emphasises the importance in an ageing population of enhancing the quality of primary and secondary education as the basis for future investments in learning and of ensuring universal access by young people to education in order to limit the numbers requiring safety net assistance later in life.

A possible response to underinvestments in education arising from underestimation of the value of education as an insurance mechanism for retirement, is to increase the school leaving age, extending to year 12 the period during which school attendance is compulsory. However, the net benefits of such a policy are questionable. Increases in productive capacity in the longer term may not materialise as people cannot be forced to study, and may simply postpone other forms of education such as learning at work, or vocational education which they would have

undertaken anyway on leaving school. The costs of such a policy include increased spending if the quality of education is to remain constant and a reduction in productive capacity (at least in the short term) as people who would otherwise join the labour force stay longer in education.

A more direct way of addressing myopia and uncertainty about the future returns to education would be to encourage the provision to first-time investors in the education market of career counselling and information about the value of educational investments in improving access to further training at work. First-time investors (no matter what their age) were identified in section 15.3.1 as being at most risk of underinvesting in education due to inadequate information.

15.3.3 Policy issues for other portfolios

A focus on education policy alone as a means of addressing any problems associated with population ageing risks downplaying the importance of the demand side of the market for skills. An expansion in educational investments will not improve economic growth unless the added human productive potential is actually converted into higher productivity. *Simul6* shows that re-training a proportion of those aged over 45 who are unemployed and without post-school qualifications has a negligible effect on the EDR and income per head, principally because upgrading to vocational qualifications adds little to the chance of older people finding a job.

An efficient labour market that provides the appropriate wage signals about which skills are needed, and that allows skills to be allocated and utilised appropriately at work, is one means of ensuring that employment is maximised. Population ageing therefore adds to other arguments (see, for example, PC 1998a, 1998b and 1998c) for eliminating institutional barriers to efficient labour markets — such as rigid institutional wage specification, narrow occupational definitions and demarcation rules — and to arguments for greater competition in product markets.

In addition, reducing any specific barriers to the re-employment of older workers will also be important. Such barriers might include wage differentials between old and young workers that do not reflect productivity differentials between the two age groups (possibly because of institutional wage setting),[9] high on-costs which may reflect superannuation policy and the risks associated with insuring older workers (via workers' compensation), and age discrimination. Research into the role of job

[9]This illustrates the importance of allowing older workers re-entering the workforce to be eligible for a re-entry or training wage if it is thought that older workers re-entering the workforce are less productive initially, thus improving incentives for employers to hire them.

tenure in hiring decisions and the factors affecting the hiring probabilities of older workers would be useful in identifying barriers to the employment of older people.

Lastly, education policy is not the only mechanism influencing incentives to invest in education and training: for example, retirement incomes policies that improve retirement incomes (superannuation plus social security) relative to earnings from employment may discourage re-training. Ingles notes that replacement rates (income in retirement as a percentage of pre-retirement earnings) in Australia are at the low end of the OECD average except for those on low incomes (Ingles 1998). Thus, a cross-portfolio perspective will be important in addressing any perceived problems associated with population ageing.

15.4 Conclusion

The pressures of globalisation and technological change have strengthened calls for Australia to become a 'knowledge economy' in the twenty-first century. Issues of education and training are naturally central to such a transformation. Somewhat paradoxically, education and training do not figure prominently in the expanding literature on the rapid population ageing which Australia will experience during the same time period. This may be due to the fact that education, unlike other areas of public expenditure, is not expected to 'blow out' as a result of ageing, quite the reverse if current policies are maintained. This raises the question, however, of whether current educational policies *should* be altered in the context of an older population. In particular, it is reasonable to question whether educational expenditure should automatically decline as a proportion of GDP. Two possible reasons for raising this question are the potential economic benefits of delaying the rise in the EDR, and the need to combat any ageing-related market failures in education and training markets. This paper has attempted to evaluate the validity of both reasons.

With respect to the former, numerical simulation results presented in section 15.2 reveal, other things equal, that greater educational attainment of the adult population has the potential to alleviate the economic burden imposed by non-workers on workers. In particular, by adopting world best practice in terms of educational attainment (*simul2* and *simul3*), Australia may be able to lower the increase in its EDR by up to 12 percentage points or, equivalently, retard it by 20 years. In addition, greater educational attainment would allow income per worker and income per head to increase, the latter by up to $46 (in 1996 dollars) per week and per person (compared with the natural increase simulated in *simul1*). Most alternative simulations, based on somewhat less ambitious goals, nonetheless confirm the positive economic impact of a more qualified population and labour force.

However, the positive simulation results — on their own — do not justify policies encouraging greater educational investments. Education is costly, and it is the net social benefits that are important, relative to the merits of other policy instruments. Well-functioning labour and education markets should, in principle, send out appropriate signals for individuals to adjust their behaviour in a way that is privately and socially optimal. Where market failure is present, governments can intervene to restore private incentives. While it is difficult to predict the impact of ageing on private incentives to invest in education, the paper suggests that ageing-related underinvestments in education may occur as a result of myopia and information deficiencies. The effects of such ageing-related underinvestments on lifetime income would be more detrimental if government budget constraints led to a narrowing of pension coverage. These effects notwithstanding, the paper is cautious about recommending any policy action in response to population ageing alone. The case for action is not strong. In addition, while ageing-related projected declines in public expenditure on education as a proportion of GDP give rise in theory to public savings, the practicalities of day-to-day policy formulation and the structure of responsibilities for different education sectors may mean these savings do not eventuate, or are achieved only with a significant time lag. Failure to achieve such savings may add to general public resource pressures associated with population ageing. In any case, a narrow focus on education alone risks ignoring potentially preferable alternatives.

Appendix 15A: Projection methodology and simulation assumptions

Projecting the population of a sub-group defined by gender, age, highest educational attainment and labour force status

Let *i* refer to the gender (*i* = 1, 2), *j* to the age group (*j* = 1, 2, … , 7), *k* to the educational attainment level (*k* = 1, 2, 3, 4), *l* to the labour force status (*l* = 1, 2, 3, 4) of a person, and *t* to the time period.

The population of any given sub-group at time *t* can be expressed as follows:

$$n^{t}_{ijkl} = p^{1997}_{kl} . p^{t}_{ij} . n^{t}$$

with n_{ijkl} = population of the $ijkl^{th}$ sub-group in period *t*

p^{1997}_{kl} = probability of belonging to the kl^{th} sub-group in 1997

p^{t}_{ij} = probability of belonging to the *ij*th age group in period *t*

n^{t} = total population aged 15–64 in period *t*.

Both p^{t}_{ij} and n^{t} are drawn from series II of the ABS population projections (Cat. no. 3222.0.).

In 2017, for example, the number of females aged 45–54 who hold a degree or higher and who are not in the labour force is equal to (0.0179 x 0.131 x 14 467 =) 34 (*simul1*, thousands).

Once the population of each sub-group is known, various aggregations are possible. For instance, the number of persons aged 15–64 (*j* = 1 to 7) of both sexes (*i* = 1 to 2) who are not working (*l* = 3 to 4) and hold a degree or higher (*k* = 4) in 2047 is given by:

$$n^{*} = \sum_{i=1}^{2}\sum_{j=1}^{7}\sum_{l=3}^{4} p^{1997}_{4l} . p^{2047}_{ij} . n^{2047}$$

By analogy, the EDR in that same year can be expressed as:

$$EDR = \frac{\sum_{i=1}^{2}\sum_{j=1}^{7}\sum_{k=1}^{4}\sum_{l=3}^{4} p^{1997}_{kl} . p^{2047}_{ij} . n^{2047} + n^{2047}_{y,o}}{\sum_{i=1}^{2}\sum_{j=1}^{7}\sum_{k=1}^{4}\sum_{l=1}^{2} p^{1997}_{kl} . p^{2047}_{ij} . n^{2047}}$$

with $n^{2047}_{y,o}$ = population aged 0–14 and 65 and over in 2047.

Modelling increases in educational attainment

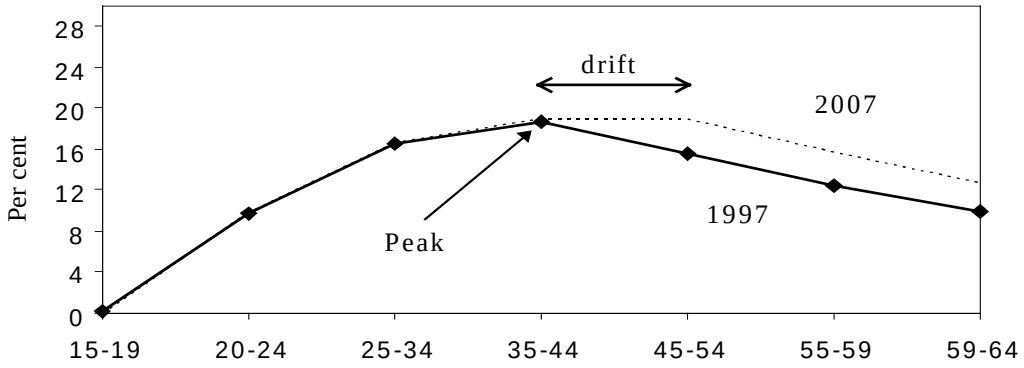
The typical age profile for holders of a given type of qualification is in the shape of an inverted U, as illustrated by the bold line in figure 15A.1 for males with a degree or higher in 1997.

This profile is characterised by an upward sloping 'acquisition' segment leading to a 'peak'. That is, for ages 15–35, the proportion of degree or higher qualification holders increases and reaches a maximum during the age group 35–44. If the acquisition of educational attainment of successive cohorts is identical, the age profile after ten years can be represented by the dashed line in figure 15A.1.

Figure 15A.1 illustrates the process leading to the natural increase simulated in *simul1* (see below). The peak is unchanged but is now followed by a 'drift' segment, representing the peak of the previous period. (For the peaks to be of identical height, it also has to be assumed that no persons 'upgrade' their qualifications from, say, a diploma to a degree, and that the survival rate of those with degree or higher qualifications is the same as that of those without this qualification.) This is due to the fact that a person remains educated once educated. In this respect, educational attainment is unlike other labour force characteristics; for instance, unemployment rates may be thought to be influenced as much by the age group (cross-section effect) as by the characteristics of the persons passing through the group (cohort effect). Note that for lower qualification levels, the peak in one period can be lower than that in the preceding period if people have upgraded their qualifications from, say a diploma to a degree.

If it is now assumed that the newest cohort is acquiring degree or higher

Figure 15A.1 **Age profile of male holders of degree or higher qualification (per cent)**



Data source: ABS (unpublished Labour Force Survey, data).

qualifications at a more rapid rate than the previous cohort during the acquisition phase, the age profile will be altered as shown in figure 15A.2.

This is the kind of shock which is simulated in both *simul2* and *simul3* (see below). The new age profile with greater educational attainment (bold curve) will itself drift to the right in subsequent periods. Thus, when a snapshot of the educational attainment age profile is taken in a given period, it is necessarily a composite of acquisition, peaks, drifts and (in some cases) increases.

Finally, it must be noted that the location of the peak — as opposed to its height — could be altered by the arrival of newer cohorts. This could be the result of, for instance, of younger cohorts staying longer in education. This possibility is not contemplated in this paper.

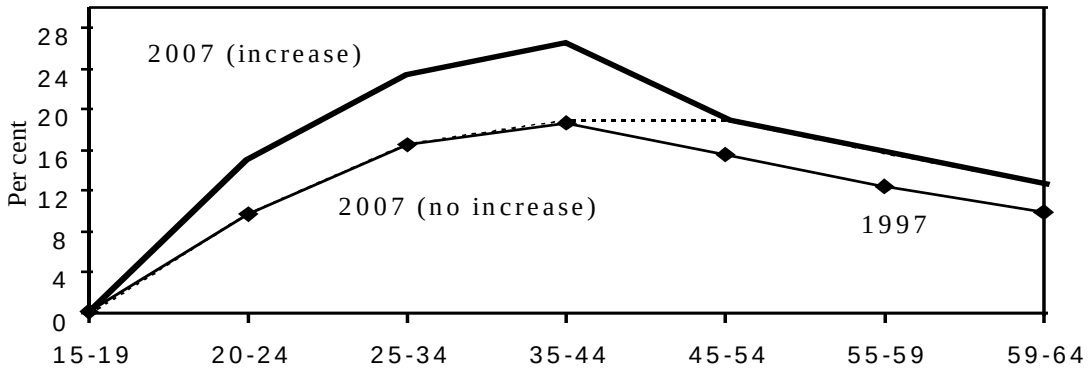
Simulation assumptions

Simul1 – baseline scenario

This scenario simulates the 'natural increase' in the overall level of educational attainment of the population, as brought about by population ageing. As better educated cohorts reach working age and less educated ones reach retirement age, proportionately more people will hold post-school qualifications in the population. However, attainment rates up to and including the peak age group (see above) are unchanged from their 1997 levels. This means, for instance, that males continue to reach a maximum rate of degree or higher attainment of 18.6 per cent when aged 35–44 (figure 2.1). Thus, in later periods, this rate can never exceed this value for males in any age group.

Figure 15A.2 **Age profile of male holders of degree or higher qualification after 10 years (per cent)**

Increase in educational attainment affecting the acquisition phase



Simul2 – world best practice (degree or higher)

In this simulation, it is assumed that the incidence of degree or higher qualifications in the civilian population aged 15–64 continues to increase and reaches 26 per cent in 2017. This figure is chosen by reference to the proportion of the US population aged 15–64 with a degree or higher qualification (OECD 1998c) and the rate of increase in the proportion of degree or higher holders in the Australian peak male age group between 1993 and 1997. Given the existence of an acquisition period mentioned earlier in this appendix, a figure of 26 per cent for the entire population implies a slightly higher value for the peak age group, estimated at 30 per cent. After the peak age group of both sexes reach this figure in 2017, and as the cohorts age, the proportion of Australians aged 15–64 with degree or higher qualifications will tend towards 26 per cent overall.

It is further assumed that the increase in the incidence of degree or higher qualifications does not occur at the expense of other types of qualifications, so age profiles for diploma and vocational qualifications holders remain unchanged. As a result, the proportion of the population with no post-school qualifications diminishes.

Simul3 – world best practice (all qualifications)

In this scenario, the proportion of degree or higher holders increases in identical fashion to *simul2*. In addition, the proportions of people with diplomas and vocational qualifications are also assumed to increase, leading to a decline in the proportion of the population in each age group without any post-school qualifications.

The assumptions made concerning the increase in the incidence of non-degree or higher qualifications are as follows.

- An increase of 42 per cent is recorded between 1997 and 2017, after which proportions remain constant. This date corresponds to that calculated in *simul2* as that when the proportion of degree or higher holders in the peak age group reaches a maximum. The 42 per cent increase on 1997 proportions applies to both sexes and all age groups up to the peak age group, and is chosen to reflect the educational profile of the leading OECD countries in terms of non-degree or higher qualifications — that is, the US and Canada. According to the OECD (1998c, p. 43) the proportion of their population aged 15–64 with either

vocational or diploma qualifications[10] is equal to 60 per cent, making it approximately 42 per cent greater than in Australia.

- As in *simul2*, the increase in the incidence of qualifications is assumed to take place up to and including the peak age group. Older age groups are assumed to register the effects of the increase in subsequent time periods only.

Simul4 – qualification upgrading

In this simulation, it is assumed that 10 per cent of qualification holders (except holders of degree or higher qualifications) in each age group up to the peak age group (inclusive) upgrade their skills in each period. Ten per cent of diploma holders in the baseline scenario, for instance, are now deemed to have moved up and become degree or higher qualification holders. The net result of this upgrade process is that the number of persons with no post-school qualifications in each age group and in each period decreases. Thus, the average level of educational attainment of the population increases.

Simul5 – second-chance education

In this simulation, it is assumed that 10 per cent of all persons from the age of 45 upgrade their qualification in the manner described in the context of the previous simulation ('moving up'). This scenario is intended to reflect the fact that the proportion of those aged over 45 participating in post-school education (particularly vocational education and training) from 1989 to 1997, has grown faster than that of those aged under 45 (although from a much lower base). This is a manifestation of the growth of lifelong learning, which is increasingly complementing traditional 'front loaded' education in Australia. Lifelong learning typically implies a *continual* upgrading of skills, mainly in the form of training (not within the scope of the present simulations), but it also includes the kind of 'second chance' education envisaged here.

Simul6 – retraining of unemployed older workers with no post-school qualifications

This final scenario examines the effects of a policy of re-training unemployed workers aged 45 and over who do not possess any post-school qualifications. This simulation is intended to measure the benefits of combating the low skills/low employability circumstances in which some older unemployed workers find

[10]Termed 'upper secondary education' and 'non-university tertiary education' respectively by the OECD

themselves. It is assumed that 10 per cent of such workers in each period undergo retraining during which they acquire vocational (basic and/or skilled) qualifications. While some of these workers will remain unemployed following retraining, a number will become employed, as the likelihood of being employed full time increases with educational attainment in each relevant age group (data not shown).

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