Chapter 3: Compulsory schooling legislation and the identification of education’s screening function

3.1 Introduction

In human capital models, individuals choose a level of education that maximises either their lifetime wealth or utility. That choice is largely unaffected by the potential decisions of other individuals. Any sense of strategy by individuals to differentiate themselves from others is relatively unimportant in these decisions, since most simple models assume that employers observe individual productivity reasonably quickly.

In screening and signalling models, individuals are also wealth or utility maximisers, but their education choices involve a substantial degree of strategy. Individuals take into account the likely choices of others in making their own decisions, because those choices provide information to other agents in the market about their unobserved ability and, hence, productivity. Individuals may take action to distance themselves from those unlike themselves, or in other circumstances choose to ‘pool’ with them by choosing the same action.

Some tests between human capital and screening theories have been based on identifying this type of strategic behaviour. Lang and Kropp (1986) used the introduction of minimum schooling legislation to identify whether those individuals not affected directly by the legislation changed their behaviour. That is, they analysed the question: if the new legislation was binding on those likely to leave early so that they now stayed longer at school, did other individuals increase their schooling to distance themselves from those affected by the legislation? The authors found that they did.

In a related paper, Bedard (2001) considers a model with three types of students: university enrollers, high school graduates and high school ‘dropouts’. Some proportion of the high school graduate group is assumed to be constrained from attending university, but has the ability to do so. In Bedard’s model, relaxation of this constraint induces more high school ‘dropouts’, since this group’s incentive to hide behind (pool with) the constrained high school graduate group falls. The author found high ‘dropout’ rates in areas of the United States where university enrolments were also high (that is, where high school graduates were relatively unconstrained).
In this Chapter a similar approach to that of Lang and Kropp is adopted. It involves looking at what happened when a jurisdiction with a legislated minimum school leaving age changed its junior school grade progression arrangements. The effect of the slower progression arrangements was to lower the grade or level at which some students reached the minimum leaving age. Since some students always leave at the earliest possible age, while others always complete high school so that they can attend university, the question addressed is what happened to the schooling choices of those in between these two groups. Did they lower their schooling, since they could now differentiate themselves from the early leavers at a lower level of schooling, or did their choices remain the same? It should be emphasised that this test is quite a difficult one for screening theory: in an era of generally increasing levels of educational attainment (university participation rates rose over the relevant period), the theory predicts that some individuals should undertake less education than their predecessors.

The case study is the Australian State of South Australia. It changed its junior school progression arrangements in the mid-1980s. These changes affected the age structures of its grade cohorts that reached senior high school in the mid-1990s. Some of those who left at the earliest possible time could now do so at a lower grade of schooling. Those intent on distancing themselves from that group no longer needed to stay to Year 12.

Between 1991 and 1999, the proportion of students who completed high school fell by 22 percentage points in South Australia. For Australia as a whole, the fall over the same time was about 6 percentage points. After taking into account State-specific factors that explain some of this differential, the evidence supports the existence of strategic behaviour by individuals in a way that a human capital model would not predict. Of course, this does not mean that education does not enhance productivity. It is simply evidence that supports the existence of signalling or screening effects in education decision-making.

The remainder of the Chapter is structured as follows. The next Section sets out the simple signalling framework utilised here and the Lang and Kropp (1986) test in a little more detail. The reforms to junior schooling in South Australia in the mid 1980s are then explained, followed by a description of the data used in this Chapter. Some preliminary evidence on what happened to Australian retention rates in the 1990s is presented in Section 3.5. The methodology used to test formally whether the policy change affected school retention is set out in Section 3.6 and the results in Section 3.7. Some research and policy implications of the results are identified in the conclusion.
3.2 Minimum schooling legislation and signalling behaviour

3.2.1 A simple signalling model

This Section summarises the predictions of a simple signalling model in which ability, \( a \), is distributed continuously, while schooling, \( s \), is undertaken in discrete quantities. The model is described in more detail in Appendix 3.1. As in other education signalling models, it is assumed that ability or productivity is difficult to measure, so employers use the education level of individuals to inform their estimates of expected individual productivity. They do this because more able individuals have lower schooling costs than less able ones.

There are three levels of schooling, denoted by \( s_0 \), \( s_1 \) and \( s_2 \), with \( s_0 < s_1 < s_2 \), though the model and its predictions can be generalised where there are more schooling levels. Initially, government regulation requires all individuals to undertake at least \( s_1 \) years of schooling. With these arrangements, \( s_2 \) can be thought of as completing school, while \( s_1 \) represents non-completion.

The question addressed through the model is what happens to the proportion of students who complete school when the government relaxes the constraint on school leaving by allowing students to leave at \( s_0 \). Only separating equilibria in the pre- and post-reform environments are considered here.

The model’s predictions are summarised in Figure 3.1, where it is assumed for presentational purposes that ability is distributed uniformly over the interval \([a_l, a_h]\), with a density function given by \( f(a) \).\(^1\) Prior to the reform (depicted in the top panel of Figure 3.1), the critical value of the ability distribution that separates individuals who choose \( s_1 \) or \( s_2 \) is \( \mu_2 \). Its exact value is determined by the distribution of marginal costs for individuals of undertaking the additional schooling and the wages employers are prepared to pay, given the expected ability of the two schooling groups. The determination of \( \mu_2 \) is described in the Appendix.

Essentially, the cut-off between the school levels, \( \mu_2 \), occurs at that point of the ability distribution where the increment in wages individuals receive for undertaking the additional

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\(^1\) No assumptions about the distribution of ability are made in the model presented in Appendix 3.1 other than that it is continuous over the specified interval.
schooling just matches its marginal costs for those individuals. Hence they are indifferent between the two schooling levels.

Figure 3.1: Pre- and post-reform outcomes of the introduction of lower school leaving requirements

(a) Pre-reform

(b) Post-reform

The critical question for the analysis is what happens to the cut-off between these two schooling levels with the change in policy. The answer is that this cut-off point is to the right of the cut-off point in the original equilibrium. The intuition is that, with the least able students now leaving at $s_0$, the expected ability or productivity of those who leave at $s_1$ increases. Employers match that increase with higher wages for those completing $s_1$. Those who were previously indifferent between education levels $s_1$ and $s_2$ are not any longer. The increment in the wage from undertaking the additional schooling has fallen below their costs of doing so. Anyone with $a_i < \mu_2$ has even higher marginal costs, so the new cut-off must lie to the right of $\mu_2$, as depicted in the lower panel of Figure 3.1. The outcome is that fewer individuals complete school by undertaking $s_2$ after the policy change than did prior to it.

A human capital model does not have the same predictions as the signalling one. Any individual who previously preferred $s_2$ over $s_1$ continues to do so after the policy change – the increment to their wage from the additional schooling remains no less than their additional costs. Unlike the screening case, there is no change to their incremental income between the two schooling levels.
The only possible reduction in individuals choosing $s_2$ would arise if some now preferred $s_0$ over $s_2$. While this is possible, it would require some unusual features in the way wages and marginal costs rise with schooling for individuals, so it is argued in Appendix 3.1 that this outcome is quite unlikely.

Consequently, it is not expected that there would be any discernible change in the proportion of the population choosing level $s_2$ with the relaxation of government policy under a human capital model.

Therefore, the models result in different predictions about the impact of a relaxation of the school leaving constraint. A human capital model would predict little change in the proportion completing school, while the signalling model predicts that the proportion would fall.

Other signalling models produce the same predictions as the one presented here. For example, the standard signalling framework set out in many sources (see for example, Kreps and Sobel 1994, Gibbons 1992: 190 – 205, Mas Collel et al. 1995: 450 – 60, Wolfstetter 1999: 268 – 275), that involves a discrete number of types generates similar predictions. A reduction in the schooling acquired by the lowest ability group lowers that undertaken by higher ability groups.

3.2.2 The Lang and Kropp (1986) test

The mirror image policy change to that described in the previous sub-section has been analysed by Lang and Kropp (1986) to assess the effect on schooling when governments introduced or extended minimum schooling legislation. In that case, the signalling model predicts that the changed government regulation results in both the low and higher ability types undertaking more schooling than before. In contrast, the schooling obtained by higher ability groups is unaffected by the introduction of a minimum schooling requirement in the case where productivity is observed. Only the schooling obtained by the lower ability types changes. That is, a strict human capital model predicts that the schooling obtained by those unaffected by the minimum schooling legislation should not change.

These observations formed the basis of the test between human capital and screening proposed and undertaken in Lang and Kropp (1986). They sought to identify whether the
education participation of groups not affected directly by a minimum schooling law changed following its passage. Lang and Kropp tested whether the education participation rates of individuals older than the legislated minimum school leaving age increased following its introduction or amendment.

Lang and Kropp (1986) estimated school age participation rates for individual States of the United States between 1910 and 1970. They found that the participation rates of older age groups increased with higher minimum schooling requirements. They interpreted their findings as supportive of screening over human capital explanations of the role of education.

In fact, the test cannot distinguish whether education is productive or not. The signalling model described in Appendix 3.1 has the same predictions to those described above when extended to incorporate productive education. Hence this test might support or reject the operation of screening in the labour market. However, it cannot reject the possibility that education increases the productivity of individuals.

The Lang and Kropp (1986) test is intuitively appealing. However, while the authors checked for any endogeneity in the minimum schooling laws (low school participation rates may force legislatures to act), they did not include any controls in their equations other than time period dummy variables.

3.2.3 Minimum schooling legislation in Australia

The results from the Lang and Kropp (1986) test could be unreliable if the changed schooling requirements coincided with government campaigns to increase schooling at all ages, as seems at least possible. In Australia, still other factors make interpretation of this type of test somewhat problematic.

Schooling is compulsory in Australian States and Territories between the ages of 6 and 15, other than Tasmania, where it is compulsory until the age of 16. Changes in Australian State minimum schooling laws since 1900 are summarised in Appendix 3.2.

Unfortunately, none of the episodes where States changed the minimum schooling legislation since 1900 provides a particularly good basis for assessing the impact of the change for the purposes of this Chapter.
In Australia, changes to the minimum schooling laws have typically been associated with substantial public high school building works, so that the observed effect involves some relaxation of supply constraints as well as changing student demand for high school places. For example, the first six State high schools were opened in Queensland in 1912, the same year that the minimum school leaving age was raised from 12 to 14 years. Similar building programs confound any assessment of changes in compulsory schooling that took place in some states in the 1960s. A further problem prevents use of the 1960s changes in minimum schooling laws to provide evidence about the operation of screening. The main state that might provide some evidence of counterfactual trends, New South Wales, added a year to its secondary schooling system. Therefore school age participation rates rose in New South Wales at approximately the same time the changes in minimum schooling requirements came into effect in the other States, making identification of the effect of those changes problematic.

Therefore, it would be very difficult to disentangle the various demand, supply and institutional effects from the changes in minimum schooling laws that took place in Australian jurisdictions since Federation to test for screening effects.

However, it is possible to use the analysis described in sub-section 3.2.1, in conjunction with the existence of minimum schooling laws, to identify screening effects. The remainder of this Chapter addresses the question of what happened when an Australian jurisdiction changed its school grade progression arrangements in such a way that typical students reached the minimum age in a different grade or level than they had previously. The question of interest is, did such a change induce different behaviour in the way other students stayed on at school? A reform that was implemented in South Australia in the mid-1980s that had just such an effect is described in the next Section, and its impact on school completion identified in the following Sections.

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2 See Barcan (1980) for a history of Australian education, which deals in passing with the history of compulsory attendance laws. For much of Australia’s history, education of older teenage students was undertaken in private (metropolitan) schools.

3.3 The Early Years of School policy in South Australia

3.3.1 Description of the policy change

The Early Years of School policy was announced in 1984 in South Australia, with implementation to start in 1985 and be completed by February 1986. The elements of the policy and its rationale were set out in Education Department of South Australia (1983), which drew on analysis in the final report of the Committee of Enquiry into Education in South Australia (Keeves Enquiry) (1982).

The major objective of the policy was to provide a better foundation for children’s subsequent educational achievement by extending and enriching their junior primary education (that is, levels below Year 3).

The new policy dictated that students ‘enrolling in government schools have between seven and ten terms in junior primary classes, that is: reception, year 1 and year 2, rather than six to eight currently prevailing, such policy to be fully implemented by 1986’ (Minister of Education, 14/11/1984, quoted in Director General of Education South Australia 1984: 10). Implementation of the policy began in the 1985 school year, when the school year still consisted of three terms. Its effect was to make the pre-Year 1 entrance level, called Reception, closer to a full year of schooling for most students rather than something less than that.

South Australia has a ‘continuous admission’ policy for 5 year olds (see Trethewey 1997 for a description of the history of this policy). It involves regular (not less than once a term) admission of recently-turned five year olds into individual schools over the school year.\(^4\) The way it operated prior to the Early Years of School policy meant that only those children who entered towards the end of the school year moved into Year 1 in the following year. Those five year olds who began towards the start of the school year moved directly into Year 2, having compressed Reception and Year 1 into just one year of school. Consequently, the Keeves Committee found that ‘for 40 per cent of the students entering the South Australian school system the Reception Grade serves no useful purpose, and for a further 14 per cent it does little more than familiarize children with school for up to one term’ (1982: 91).

\(^4\) Of the other Australian jurisdictions, only the Northern Territory has a similar policy. It operates only for children turning five in the first half of the year. Primary school in South Australia consists of Reception plus Years 1 to 7; Secondary school Years 8 to 12.
The Keeves Committee had received proposals to add a further year of secondary education to the South Australian school system. Students going from school to university were younger than their Eastern State counterparts and were considered immature, a factor that was purportedly reflected in low levels of achievement in subjects such as Chemistry and Physics (1982: 88). Rather than accepting such proposals to address the perceived immaturity of school leavers, the Committee instead proposed that children spend more time in junior primary school, the changes effectively implemented under the Early Years of School policy. The Committee acknowledged that these changes would take a long time to take effect (13 years), but that increased use of grade repetition could be made at the junior primary and primary levels to achieve the same result (1982: 94).

The nature of the Early Years of School policy reform is summarised in Figure 3.2. It shows how children who turned five at different times of the year progressed through to Year 3 both before and after the policy change. It also shows how this affected the grade or school level in which they turned 15, the minimum school leaving age in South Australia.

Those who turned five after the commencement of the last term in any year and before February of the following year commenced school at the beginning of the school year in February. Prior to the reform, they typically completed just two years of schooling (six terms) before entering Year 3. After the reform, they completed three years (nine terms) before entering Year 3. Since they were now a year older when they reached Year 3, they turned 15 one grade or level earlier, either late in Year 9 or just after they completed Year 9.

All other children were unaffected by the change. Children who turned five after the commencement of the school year and before the beginning of the final term (from the beginning of February to mid-September) entered school during the year and typically spent

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5 The Committee found that the average age of South Australian school students in Year 7 had fallen relative to that in other States (by half a year) between 1964 and 1979 not because of changes in the way Reception operated, but from changes in grade repetition policies in lower and middle primary school levels (1982: 88).

6 The formal policies are set out in Appendix 3.3. The current policy has been updated to reflect the move from a three to four term school year in South Australia.
more than two years at school before they entered Year 3. The *Early Years of School* policy did not affect the way this group progressed through junior primary school or the grade in which they reached the minimum school leaving age.

**Figure 3.2: Changed junior primary school arrangements from the implementation of the *Early Years of School* policy**

<table>
<thead>
<tr>
<th>Month when turning five years old</th>
<th>Terms required in Junior primary before beginning Year 3</th>
<th>Year when reach minimum schooling age of 15 (and age on 1 July in Year 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-reform</strong></td>
<td><strong>Post-reform</strong></td>
<td><strong>Pre-reform</strong></td>
</tr>
<tr>
<td>September</td>
<td>6 terms</td>
<td>In or just after Year 10</td>
</tr>
<tr>
<td>October</td>
<td></td>
<td>In or just after Year 9</td>
</tr>
<tr>
<td>November</td>
<td></td>
<td>(12 years)</td>
</tr>
<tr>
<td>December</td>
<td></td>
<td>(13 years)</td>
</tr>
<tr>
<td>January</td>
<td></td>
<td><strong>Pre- and post-reform</strong></td>
</tr>
<tr>
<td>February (a)</td>
<td>8 terms</td>
<td>Year 10</td>
</tr>
<tr>
<td>March (a)</td>
<td></td>
<td>(13 years)</td>
</tr>
<tr>
<td>April</td>
<td></td>
<td><strong>Post-reform</strong></td>
</tr>
<tr>
<td>May</td>
<td></td>
<td>Year 10</td>
</tr>
<tr>
<td>June (a)</td>
<td>7 terms</td>
<td>(12 years)</td>
</tr>
<tr>
<td>July (a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Those who turned 5 after the commencement of a term may have enrolled during it if their school had more than one intake per term.

Figure 3.2 is indicative only. All policies provide a set of guidelines for the treatment of ‘typical’ individuals and a set of clauses that cover exceptions. Nevertheless, it appears

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7 Hence, prior to the policy change they entered the grade cohort that followed those in the first group in Figure 3.2. After the change, they were part of the same cohort.

8 Soon after the introduction of the *Early Years of School* policy the structure of the school year changed in South Australia which requires some amendment to the diagram. Prior to the introduction of the four-term year in 1987, the three school terms typically commenced in
consistent with the data contained in the Keeves Committee’s Final Report that showed there was some ‘bunching’ of students commencing at the start of the school year (about 40 per cent of the grade cohort).

The Early Years of School policy also changed the age composition of grade cohorts. They became older. Figure 3.2 indicates how the age distribution of grade cohorts changed as a result of the policy change. It reports the age of students in the middle of their first year of secondary school, in Year 8. The focus is on their age at July 1, since this is the reference period for the data used in subsequent Sections. The change in the composition of the cohorts meant that the reported ages of students in Year 8 went from being approximately split between twelve and thirteen years prior to the change to predominantly thirteen years after it. Since about 40 per cent of students were affected by the change, the proportion aged 12 in Year 8 should have fallen by approximately that figure.

The most important point from Figure 3.2 for the analysis that follows is how the change in the grade cohort composition affected the grade at which its members reached the minimum school leaving age. Prior to the change, the entire cohort reached that age during or immediately after their Year 10. After the change, those directly affected by the policy who now had to undertake three years of junior primary school (40 per cent of the cohort from the Keeves committee) turned 15 towards the end of or immediately after their Year 9. The rest of the cohort continued to turn 15 in Year 10.

The implementation of the Early Years of School policy took place over 1985 and 1986. It affected entrants to Year 3 from 1985. That particular cohort reached Year 8 in 1990 and Year 12 in 1994, with the 1986 cohort obviously reaching those levels in the following years. Those calendar years will be critical in the assessment of the impact of the policy change.

3.3.2 The policy change and the predictions of the screening model

The Early Years of School policy was introduced with the intention of influencing the school achievement of South Australian children. It was designed to have an impact on achievement at the upper levels of secondary school. Its potential effect on educational attainment (the early February, late May and mid-September respectively. With four terms, the terms commenced in late January, late April, mid to late July and mid-October (South Australian Department of Education Calendar, various years).

9 Of course, there were some exceptions to this ‘rule’.
levels students reach, such as Year 12) was unspecified, though it seems likely that it was assumed that a reform that improved junior primary school experiences and subsequent achievement would also encourage school students to stay longer at school. Certainly, one of the objectives of other changes proposed by the Keeves Committee was to increase retention rates at the upper secondary school level (1982: 277).  

The question now becomes: what was the likely impact of the reform on behaviour at the senior secondary level? The effect of the increase in schooling at junior primary levels was to increase student ages for a substantial proportion of the grade cohort at each grade or level of secondary schooling. This meant that a substantial number of students reached the minimum school leaving age at a lower grade or level than their predecessors did – that is a new lower leaving level, akin to $s_0$ in Figure 3.1, was available to them.

Those students who always left at the minimum possible level still could, but at an earlier grade. Other students who wanted to distance themselves from the early leavers, but did not intend to undertake post-school education and training, were now able to do so by acquiring less education than they had to previously. Those who previously undertook further education to differentiate themselves from the intermediate group were now able to do so by completing school only, potentially affecting university participation rates. However, this last effect may be harder to identify in circumstances where university places were previously supply-constrained and were made more widely available, as happened in Australia over the 1990s.

Since the purpose of the policy was to increase age school participation rates, so that those who progressed to university were older than they had previously been, changes in those rates cannot be used to test the signalling/screening model. However, information about Year 12 retention rates, which measure the proportion of the cohort who commence secondary school in a given calendar year who proceed to Year 12 four or five years later, can be used to test

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10 When the Keeves Committee undertook its review, the Year 12 retention rate was below 40 per cent in South Australia.

11 The impact of the policy on school age participation rates would be the same under both human capital and screening models. Nobody leaves school at a younger age than before, but some of those proceeding to university or other forms of post-school education stay one year longer at school than previously. Hence, school age participation rates rise because of the changed structure of schooling.
the model. That is, Year 12 retention is a measure of school completion that matches the proportion of interest from the signalling model discussed in sub-section 3.2.1.\textsuperscript{12}

Little change took place in the age structure of the Year 8 cohorts in most other Australian jurisdictions at this time. This means that they provide a good basis for estimating the counter-factual case for South Australia. That is, it is possible to test whether South Australia’s relative Year 12 retention performance declined after the cohorts affected by the Early Years of School policy reached Year 12 by comparing it with those jurisdictions where the cohorts’ age structures were unchanged.

3.3.3 Level of attainment and years of schooling

The model described in Appendix 3.1 is based on completion or non-completion of various schooling or educational levels. Human capital models typically involve choice of ‘years of schooling’ and screening or signalling models something like learning ‘intensity’ or effort, though Noldeke and van Damme (1990) showed that the education dimension can be treated as involving a choice of years or of levels. Qualification effects were central to some tests of screening theory described in Chapter 2, such as those undertaken in Lui and Wong (1982), Hungerford and Solon (1987) and Frazis (1993). Therefore, educational level seems a natural dimension for a test of screening theory.

Its relevance for a human capital model requires more justification. The policy change analysed here forced some individuals to undertake an additional year of junior primary school. Those who subsequently left at a lower level may have simply substituted the additional year of junior primary school for a year of secondary school and, hence, have completed the same ‘years of schooling’ as their predecessors. Consequently, any observation of earlier leaving in terms of grade attained may not reflect any change in the years of schooling obtained by individuals. Therefore, it is necessary to make a case that grade attained provides a dimension of schooling additional to the aggregate number of ‘years of schooling’. This dimension also needs to be important in assessing the education that different individuals obtain.

\textsuperscript{12} Other measures of school completion could be used to test the theory. In fact, results that use an estimate of school ‘completion’ described below match closely the Year 12 retention results. However, Year 12 retention is preferred because of its historical role as an outcome measure of the Australian school system.
One justification for focussing on school level is simply that empirically, numerous studies have shown that school completion has a major effect on individuals’ subsequent labour market outcomes in Australia. Lamb et al. (2000) is a recent example of such studies. This effect occurs despite the fact that completion of Year 12 involves different ‘years of schooling’ across Australia – representing 12 years in Queensland and Western Australia and 13 years elsewhere.13

Second, even in human capital models, ‘years of schooling’ is not necessarily the only dimension of schooling of importance. The quality of the schooling also matters and affects at least educational attainment and possibly wages (relevant studies include Behrman and Birdsall 1983, Card and Krueger 1992, Heckman et al. 1996). Those who completed Year 12 after the reform clearly undertook more years of schooling and had at least the same quality of education as their predecessors and were, presumably, better placed to undertake further studies. However, to maintain that the education of someone who studied from Reception to Year 11 under the new arrangements received the same education as someone who previously completed Year 12 is to equate implicitly completion of Reception with Year 12 in their measure of schooling. It is doubtful that those years of schooling are equivalent.

Third, it is possible to use other Australian data to make some estimate of what effect the change might be on aggregate retention rates in South Australia if individuals choose only their ‘years of schooling’. These estimates are presented in sub-section 3.5.4, after the data used here have been described.

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13 Studies by economists of the determinants of Australian wages use either years of schooling or grade attainment to describe the education of individuals. Australian studies have not compared the results using both approaches, though Card (1999) reports on studies with United States data that do. As an experiment, both descriptions of education were included in a least squares wage equation estimated separately for male and female full-time employees from the 1997 Survey of Education and Training by the ABS (ABS 1998). Both years of schooling and the qualification level variables were positive and significantly different from zero. For males, the coefficient on the years of schooling variable in the combined equation was forty per cent of its size when entered alone (0.024 compared with 0.058), while the coefficients on the qualification level variables were about a third lower in the combined equation. The results for females were similar. It seems reasonable to conclude that both dimensions of schooling are important in explaining Australian wages.
3.4 Data used in the analysis

Most of the data used in the Chapter are taken from the National Schools Statistics Collection (NSSC), which is published by the ABS in *Schools Australia* (Cat. No. 4221.0). While the NSSC includes information on government and non-government schools and staff, the analysis in this Chapter mostly uses information on students. Specifically, the focus is on full time student numbers in each Australian State and Territory cross-classified by age and year or level of education. These data allow replication of Year 12 retention rates, which estimate the proportion of the cohort who commence secondary school and proceed to Year 12 in the minimum possible number of years.

An adjusted retention rate measure is used in this Chapter. Three adjustments are made to the standard definition to produce estimates that are consistent across jurisdictions and to minimise the effects of departures or additions on the cohort through either grade repetition or migration. First, for all jurisdictions, retention rates are estimated by dividing the number of Year 12 students in calendar year $t$ with the number of Year 8 students in calendar year $t - 4$ (in jurisdictions with six years of secondary school, the official estimate uses $t - 5$). Second, only those Year 8 students aged 12 to 15 years (inclusive) are counted in the denominator and only those Year 12 students aged 16 to 19 in the numerator. Third, the estimates are adjusted for changes in the population of the relevant ages in jurisdictions over these years. These adjustments do not affect the nature of the results reported in subsequent Sections.

There are two particular limitations in the NSSC data for the analysis undertaken here. First, the data do not allow identification of the prevalence of Year 12 repetition by those within the four age groups treated as the ‘cohort’. Second, the data relate primarily to full time students. While some data on part time students have been published since 1995 in the NSSC, it is only available by year or level and earlier unpublished data are considered too unreliable for release. Since both of these factors are forms of school participation that individuals may choose and their incidence has reportedly changed over time, their mis-measurement in these data might affect the validity of the inferences drawn here. Attempts to incorporate estimates of both of these factors in the analyses are described below.

Use is also made of data on Year 12 completion published by the Department of Education, Training and Youth Affairs (DETYA) through the annual *National Report of Schooling in...*
Australia (Ministerial Council on Education, Employment, Training and Youth Affairs, MCEETYA, various years). The completion data are provided to DETYA by the State certification bodies. Those numbers are divided by the estimated population that could attend Year 12 in the jurisdictions to provide a proportionate ‘completion rate’. Because the State certification agencies provide the number of completers by postcode, DETYA also estimates Year 12 completion by broad socio-economic status (SES) within States. DETYA uses ABS SES indexes based on data from the 1991 and 1996 Censuses to do this.

In contrast to the ABS retention rate estimates, the completion rate data include part time students who complete Year 12. However, like the ABS figures they include students who repeat Year 12. The completion rate estimates broadly reflect the national trends evident in the ABS retention rate estimates. Completion rose substantially between 1989 and 1991, remained at its peak for a few years before falling between 1994 and 1996, after which it began to increase slowly.

Other data utilised for this Chapter are primarily drawn primarily from ABS sources. Appendix 3.4 contains the definitions of these variables and their sources.

3.5 Preliminary Evidence

This Section contains a preliminary assessment of the data to establish whether there is any evidence that Year 12 retention fell in South Australia following the implementation of the Early Years of School policy. This initial assessment supports the following propositions:

- That the effect of the Early Years of School policy was to change the age distribution of grade cohorts in South Australia in the direction expected. Smaller increases in the ages of grade cohorts occurred in the Northern Territory and Queensland, but there was no change in age distributions in other jurisdictions;

- Year 12 retention fell more in South Australia than elsewhere, and the timing of the fall coincided with the ageing of grade cohorts;

14 The completion rate estimates have been published by jurisdictions since 1995 in the National Report of Schooling in Australia. DETYA provided earlier unpublished data.

15 The definition of ‘completion’ used by the State authorities differs, but as long as their definitions remain consistent through time, this should not affect the results.
• Year 12 retention fell because more students left at lower levels of schooling, as well as Year 11. That is, more students left at Years 9 and 10 than had been the case before the change in policy; and

• That while other potential factors may have made some contribution to the decline in retention in South Australia, they did not explain all of the observed fall.

These points are now dealt with in turn.

3.5.1 The ageing of the grade cohorts in South Australia

The *Early Years of School* policy had its desired effect on the age structure of grade cohorts. More than half the South Australian Year 8 cohort (the first year of secondary school in that State) was aged 12 in 1985. By the mid-1990s, less than 10 per cent were aged 12. The proportion aged 13 years doubled from 40 to over 80 per cent.

Figure 3.3 shows the proportion of students who were aged 12 years in their first year of secondary school in South Australia from 1985 to 1999. Since the effect of the *Early Years of School* policy was to increase the typical age of students in each year, the proportion aged 12 in Year 8 should fall as the 1985 Year 3 cohort moved through the grades, that is, from about 1990. In fact, the proportion fell in 1989 and then very substantially after 1990.\(^{16}\) The diagram supports the idea that the policy was phased in over some years, with its overall effect spread over about five years.

3.5.2 Year 12 retention in South Australia and other jurisdictions

Year 12 retention rates fell in Australia after 1992, following a period over the 1980s where they rose consistently. In 1980 the Australian rate was less than 40 per cent, but had doubled by 1992 to 77 per cent. Thereafter the retention rate fell by about 6 percentage points over the four years to 1996 before appearing to stabilise at around 72 per cent. In 1999, the national retention rate was 72.3 per cent.

\(^{16}\) The fall in the proportion aged 12 in 1989 appears to reflect changed grade repetition behaviour in primary school for that particular cohort compared to earlier ones, rather than any anticipation of the changed policy prior to 1985 in their junior primary school progression.
Over the period from 1992 to 1999, the retention rate in South Australia fell by 22 percentage points, from 88 per cent to about 66 per cent. This decline, along with changes in the proportion of the relevant Year 8 cohort who were aged 12 years, is shown in Figure 3.4. The start of the decline in the retention rate in South Australia coincides with the beginning of the decline in the proportion aged 12 in Year 8. There is nothing particularly special about the choice of start dates in the Figure 3.4. Prior to 1991, the percent aged 12 line was approximately horizontal, while the retention rate was increasing, up from 55 per cent in 1986.

(a) The per cent aged 12 in Year 8 matches the cohort used in the retention rate.
This pattern of poorer retention performance in conjunction with older grade cohorts was matched in other States. Figure 3.5 shows the proportion aged 12 in Year 8 in five jurisdictions – the three where it fell over this period, South Australia, Queensland and the Northern Territory, with two States where it did not, New South Wales and Western Australia. The first is included because it is the largest State and the second because it has or had a comparable schooling structure to the first three jurisdictions. Figure 3.6 shows the retention rates for those same jurisdictions.\textsuperscript{17}

\textbf{Figure 3.5: Proportion of the cohorts who were aged 12 in Year 8 in selected jurisdictions: 1991 – 1999 (per cent)}

In South Australia and the Northern Territory, where the ageing of the cohort was considerable, the decline in the Year 12 retention rate was also substantial (in excess of 15 percentage points).\textsuperscript{18} However, the timing of the declines in the Northern Territory is not

\textsuperscript{17} The other jurisdictions are excluded simply to avoid clutter.

\textsuperscript{18} There are close links between the South Australian and Northern Territory education systems. They share a common structure (a pre – Year 1 level plus seven years of primary school and five years of secondary school), have similar continuous enrolment policies for five year olds and common senior secondary certification arrangements (the South Australian Certificate of Education) which are administered by the same (South Australian) body. In fact, the South Australian Education Department administered the Northern Territory government school system until 1970 on behalf of the Commonwealth and its influence on that system quite obviously remains strong. However, the formal Northern Territory policy on progression for students through the Early Childhood Program (to the end of Year 3 – so that it includes one additional year compared to the South Australian junior primary
synchronised in the same way as in South Australia. In Queensland where the ageing of the cohorts was gradual and less marked, retention rates were lower in 1999 than they had been in 1991, but the difference was small. In New South Wales and Western Australia, where the cohorts did not age, retention rates were higher in 1999 than in 1991 and only marginally below their 1993 peaks (rather than 1992, when the national rate peaked).

**Figure 3.6: Year 12 retention rates in selected jurisdictions: 1991 – 1999**

(perm cent)

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<tbody>
<tr>
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<td></td>
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<tr>
<td>QLD</td>
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</tbody>
</table>

3.5.3 School leaving both before Year 10 and in Year 11 in South Australia

Table 3.1 provides information on the typical progression of a grade cohort through senior secondary school. That is, it describes at what level students leave the school system in the different jurisdictions. This behaviour is analysed at the start and end of the 1990s to identify differences in progression through the grades by the cohorts between those two periods. In addition, averages of three cohorts for each period are taken to smooth out year to year variability.

Table 3.1 has a number of interesting features. The first is that cohort progression behaviour in most jurisdictions was similar in the latter part of the 1990s to the early years. That is, structure) still envisages that those who enter school at the beginning of the school year can complete the program in three years, while those who enter later in the year will spend more than three years completing it. That is, the formal policy is similar to the South Australian policy before the introduction of the *Early Years of School* policy.
while retention rates stopped increasing in the 1990s, they did not fall substantially in most Australian jurisdictions. The exceptions are South Australia, the Northern Territory, and to a lesser extent, Queensland.

Table 3.1: Average school completion of grade cohorts at the beginning and end of the 1990s by jurisdiction (per cent)

<table>
<thead>
<tr>
<th></th>
<th>1991-93</th>
<th>1997-99</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Left in Year 10 or before</td>
<td>Left in Year 11</td>
</tr>
<tr>
<td>NSW</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>VIC</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>QLD</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>SA</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>WA</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>TAS</td>
<td>32</td>
<td>14</td>
</tr>
<tr>
<td>NT</td>
<td>39</td>
<td>10</td>
</tr>
<tr>
<td>ACT</td>
<td>(a)</td>
<td>(a)</td>
</tr>
</tbody>
</table>

(a) The ACT’s senior college system attracts students from nearby NSW for Years 11 and 12, which confounds these calculations.

Second, in South Australia, 15 per cent of students in grade cohorts left school before Year 12 in the early 1990s - 5 per cent before Year 11 and 10 per cent following completion of Year 11. In the latter 1990s, after the effect of the Early Years of School policy on cohort ages, 16 per cent of students in cohorts left school before Year 11. That is, early school leavers left one grade lower than they had previously in South Australia. The fall in retention rates in South Australia occurred because an additional 18 per cent of students in those latter cohorts chose to leave school after Year 11, rather than staying on to Year 12 as in earlier cohorts. These effects seem to accord very closely with the predictions of the signalling model outlined earlier.

This pattern of earlier school leaving by cohorts in South Australia is confirmed in Figure 3.7. It shows the level of schooling attained by members of cohorts that reached Year 12 in each year from 1991 to 1999. What is clear is that the lower Year 12 retention outcomes from 1994 onwards (when the first cohort affected by the policy change reached Year 12) reflect both higher levels of early-school leaving (that is after Years 9 or 10), as well as higher levels of students leaving after completion of Year 11. More individuals left school in
Year 10 than before, and some left in Year 9, which was quite unusual prior to 1994 (in fact, it was effectively precluded by the age distribution of the grade cohorts, given the junior school progression arrangements and the legislated requirement to stay at school to age 15).

**Figure 3.7: Cohort school attainment outcomes: South Australia 1991 – 1999**

![Bar chart showing school attainment outcomes for South Australia 1991 to 1999.](image)

### 3.5.4 Other explanations for the fall in South Australian retention rates

One problem with the interpretation for the relative decline in Year 12 retention rate in South Australia is that other potential causes have been ignored. Other factors may well have affected the Year 12 retention rate in South Australia differentially from other jurisdictions. Three ‘official’ potential causes have been identified for the decline in retention rates in jurisdictions after the early 1990s. These were (see Ministerial Council on Education, Employment, Training and Youth Affairs, MCEETYA, 1996) that:

- part time study options increased at senior secondary levels;

- non-school based vocational programs through TAFE and other providers became more prevalent; and

- Year 12 repetition fell with increased availability of higher education places.

Lamb (1996) reported that Year 12 repetition increased substantially in the late 1980s and early 1990s in South Australia and the Northern Territory following changes in certification requirements. Penalties imposed on the marks of students who repeated Year 12 were
removed in the late 1980s, resulting in the growth in such students (captured in the ABS data). Changed arrangements for part time students from the early 1990s apparently channelled repeating students through that route (part time students are not captured in the ABS data). The overall outcome was that the changed certification arrangements first inflated the jurisdictions’ retention rates then exaggerated their decline from 1992.

South Australia and the Northern Territory do have high numbers of part time students (of all ages) relative to the size of their systems compared with other jurisdictions, and South Australia had quite high levels of Year 12 repetition in the early 1990s. Essentially, these explanations suggest that Year 12 student numbers are measured poorly. However, both Table 3.1 and Figure 3.7 provide evidence that something more than the measurement of Year 12 retention changed in South Australia in the mid 1990s. Retention to Year 12 fell because more students left at all previous levels of schooling. Therefore, while these effects might have been of some importance in South Australia, it seems unlikely that they explained all of the change in retention rates in that state during the 1990s.

Another potential complication for the analysis is that South Australia (and the Northern Territory) introduced the South Australian Certificate of Education (SACE) in 1992, which affected the cohort of students who reached Year 12 in 1993. The SACE involves the completion at the required standard of a course of approved study units undertaken over two or more years and is considered to be part of the explanation for some growth in part time students in those jurisdictions. Once more, however, the move to earlier school leaving in South Australia from 1994 would appear to rule out the introduction of the SACE as the primary cause of fall in Year 12 retention, both in terms of its timing (after the introduction of SACE) and its character (more students left before the start of Year 11).

The results reported below attempt to incorporate the various effects of TAFE alternatives to senior schooling, Year 12 repetition and part time school study. The evidence suggests that they might explain part, but not the entire decline in Year 12 retention in South Australia.

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19 Tasmania has a comparable share of part time Year 12 students. It nevertheless experienced increased full time Year 12 retention over the 1990s.
20 The certification arrangements that applied in senior secondary school in Australian jurisdictions in 1993 are described in detail in Russell (1993).
In addition to these ‘institutional’ effects, economic factors might have affected retention rates. Year 12 retention rates ceased to increase during the recession of the early 1990s, so it is possible that economic factors played some role in this outcome. Therefore, Section 3.7 and Appendix 3.5, contain regression analyses that attempt to isolate the effect of cohort ageing on retention rates in Australian jurisdictions from other potential effects.

The final issue addressed in this sub-section is the human capital interpretation of the effect of the policy change – the possibility that the individuals affected by the policy change simply substituted a year of junior primary school for one of secondary school and obtained the same ‘years of schooling’ as their predecessors. Of course, those affected by the policy but who intended to continue to post-school study after Year 12 still had to complete their schooling. These individuals are likely to have made up just over half of the 40 per cent of students affected by the policy change.\(^{21}\) If every other individual affected by the policy change left school at a lower level than their predecessors, the retention rate would have fallen by about 17 percentage points, close to the decline actually observed.

That all students affected by the policy change would not complete school, other than those looking to continue to further education, seems quite unlikely. Moreover, such behaviour would be at odds with that of individuals in other Australian jurisdictions that already had 13 years of schooling and who were presumably making their ‘year of schooling’ decisions with the same human capital considerations in mind as now faced students in South Australia.

In States with 13 years in their school structure, approximately 85 per cent of students in Year 11 (twelve years of schooling) went on to Year 12 (thirteen years of schooling) in the early 1990s.\(^{22}\) South Australia’s overall continuation rate was 89.5 per cent in the early 1990s. Assume that the 60 per cent of South Australian students unaffected by the policy change behaved in a similar manner to the average of the other states, since they were the same age as the dominant cohorts in those other states. That implies that the ‘young’ 40 per

\(^{21}\) Continuation rates to higher education in either of the two years after individuals completed Year 12 averaged about 40 per cent in the years from 1991 to 1993 in South Australia. Nationally in the mid-1990s, about 15 per cent of Year 12 completers entered TAFE courses in the year following completion of their schooling (Lamb et al. 2000: 33, Table 4.1). The estimates in the text assume that these further education continuation rates apply to those affected by the policy change.

\(^{22}\) The calculations in this paragraph are based on the figures in Table 3.1.
cent in South Australia, those eventually affected by the policy change, had a continuation rate to Year 12 of about 96 per cent. If the continuation rate for those affected by the policy change dropped to the national average after its implementation, the effect would be to bring down aggregate retention rates by 4 to 5 percentage points in South Australia. This provides a better baseline estimate for any expected decline in retention in South Australia if schooling choices elsewhere in Australia reflect only human capital considerations.

### 3.6 Methodology

The effect on South Australian Year 12 retentions rates of the *Early Years of School* policy can be described with the aid of the following simple characterisation. That is, assume that the retention rate, \( r \), in South Australia (jurisdiction \( j \)) in year \( t \) can be portrayed as

\[
(3.1) \quad r_{jt} = \alpha_j + P_{jt} + S_{jt} + D_t + u_{jt}
\]

where \( \alpha_j \) captures jurisdiction-specific factors that affect retention, but are constant through time, \( D_t \) reflects factors that affect all jurisdictions in the same way, but which vary from year to year, \( P_{jt} \) measures the impact of the policy introduced in year \( \tau \), \( S_{jt} \) reflects other aspects of the education system in the jurisdiction and \( u_{jt} \) is an error term with a zero mean. Equation (3.1) simply means that in any calendar year, retention in any jurisdiction reflects the structure of education (\( S_j \)), historical patterns (\( \alpha_j \)), trends in other factors common across jurisdictions (\( D_t \)), policy changes (\( P_{jt} \)) and factors unique to that jurisdiction in that year (\( u_{jt} \)).

The effect of the policy change in period \( \tau \) can be isolated by comparing the pre- and post-implementation retention performance in the jurisdiction that made the policy change (South Australia) with those of some other jurisdiction in the same years. The ‘difference in the differences’ approach can be used to estimate the effect of the policy change. This approach is common in the ‘natural’ or quasi-experimental literature.

Angrist and Krueger (1999) and Meyer (1995) describe the difference in the differences approach.\(^{23}\) Angrist and Krueger characterise difference in the differences strategies as ‘simple panel-data methods applied to sets of group means in cases where certain groups are

\(^{23}\) Ashenfelter and Card (1985), Card and Krueger (1994) and Card (1990) are studies that use the difference in differences approach to determine the effects of specific policies or policy changes or other one-off events.
exposed to the causing variable and others are not. This approach, which is transparent and at least superficially plausible, is well-suited to estimating the effect of sharp changes in either the economic environment or in government policy’ (1998: 1296).

In this case, the effect of the policy is measured by the comparison in retention rates between jurisdictions \( j \) (South Australia) and \( k \) (other Australian jurisdictions) in time periods \( t \) (after the implementation of the policy) and \( \tau - 1 \) (the year before its implementation), where \( t > \tau \). That is, the expected effect of the policy change is given by

\[
E[ (r_{jt} - r_{j\tau-1}) - (r_{kt} - r_{k\tau-1}) ] = P_{jt}
\]

Meyer (1995) makes use of prior work by Campbell (1969) and Cook and Campbell (1979) that describes ‘threats to the validity’ of this approach. This work describes threats to:

- **Internal validity** – the extent to which the conclusion can validly be drawn that differences in the dependent variable were ‘caused’ by the policy change (other factors may have been omitted, including interactions between time and the jurisdiction specific factors, or the policy change may have been endogenous);

- **External validity** – the extent to which the effects found in some experiment can be generalised to other individuals, times, contexts and outcomes; and

- **Construct validity** – where there is some confusion over what exactly is the cause and/or the effect, which may arise where some treatment or policy change has a number of dimensions.

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\( ^{24} \) Since \( E[( (\alpha_j + P_j + S_j + D_t + u_j) - (\alpha_j + S_{j,\tau-1} + D_{\tau-1} + u_{j,\tau-1}) ) -
((\alpha_k + S_{k,\tau-1} + D_{\tau-1} + u_{k,\tau-1}) ] = P_{jt}

if either the other aspects of the education system are unchanged over the relevant period in both jurisdictions (\( S_{jt} = S_{jt,\tau-1} \) and \( S_{kt} = S_{kt,\tau-1} \)), or if they do change, they do so in similar ways (\( S_{jt} - S_{jt,\tau-1} = S_{kt} - S_{kt,\tau-1} \)). The residuals disappear because each term has an expected value of zero.
These issues lie behind Angrist and Krueger’s (1999) expressed caution about the approach being ‘superficially plausible’. The critical issues for this study involve threats to internal validity, reflected in the assumptions:

- That the jurisdiction- specific effects do not change over time. This is obviously more reasonable the shorter the time between the two years in which the comparisons are made;

- That external factors (the $D_i$) have identical effects on retention in every jurisdiction. This would be a problem, for example, if recessions had substantially different effects on jurisdictions;

- That either other education policies are constant over time or that all jurisdictions adopt policies with similar effects on retention other than the one under consideration; and

- That there are no interaction effects between any of the separately identified influences on retention in equation (3.1).

These assumptions are relaxed in estimating the effect of the Early Years of School policy on South Australian retention rates reported in Section 3.7 and do not appear to influence the results.\textsuperscript{25} One problem, that is essentially a construct validity issue, should be noted at this point: it is possible that the policy change lowered South Australian retention rates, but an effect other than signalling or screening might be responsible for the outcome. Instead, peer or neighbourhood effects (see Heath 1999) or ‘social distance’ effects, as described in Akerlof (1997), may be the generating mechanism, triggered by the policy change. That is, the results could confirm that individuals take account of the decisions of others in ‘choosing’ their education level, without identifying their reason for doing so. This problem is considered further in the discussion of the results.

In order to validate the use of the difference in the differences technique, tests were undertaken to check that it did not generate spurious results for differences in retention

\textsuperscript{25} Specifically: the constancy of the jurisdiction- specific effects over two time periods is tested; the $D_i$ are replaced by economic variables that vary by jurisdiction; the effect of other changes in education policy are picked up by other variables that reflect the education and training systems of jurisdictions; and the presence of some key interaction effects is tested.
between Australian jurisdictions over another time period. Difference in the differences estimates comparing South Australia with the other Australian jurisdictions were undertaken for the period 1982 to 1990. These estimates covered all single, two and three year gaps between any two comparison years over this period. One observation (out of 21) was significant at the five per cent level using a two tailed test and a further one was significant with a one tailed test. Both of these observations were of tests of changes in retention between adjacent years and both indicated that retention had increased more in South Australia than in other jurisdictions. Where the differences were estimated over longer periods to smooth out some variability, as in the tests undertaken below, there was no basis for considering that retention performance in South Australia was different from that in other Australian jurisdictions. There was no evidence in the estimates from the period between 1982 and 1990 that retention performance was poorer in South Australia than elsewhere.

In addition to assessing the impact of the policy change with the difference in differences technique, a simple fixed effects regression equation that reflects the structure of equation (3.1) was also estimated. The equation explains Year 12 retention rates for Australian States and Territories from 1991 to 1999. This period includes the final observations of the long period where school retention increased, its subsequent fall and ‘plateauing’ over the remainder of the 1990s. The dependent variable in the equation is the log of the odds ratio of the retention rate. The $\alpha_j$ are replaced with a series of State and Territory dummy variables and the $D_t$ with time dummy variables. Differences in the education systems ($S_{jt}$) are captured with a variable reflecting the proportion of 17 year olds in a jurisdiction studying at a TAFE college. This variable is interpreted as reflecting alternatives to school in jurisdictions, both educational and some labour market alternatives, since apprentices and trainees are included in the TAFE student figures. The policy change is modelled in two

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26 The addition of data for 1989 and 1990 to the estimation period does not change the nature of the results presented below. The estimated effect of the policy change was slightly higher when measured by the proportion of 12 year olds in Year 8 and slightly lower when the policy dummy variable was used. The TAFE student data by jurisdiction are not available for years before 1989.

27 That is, $\log \left( \frac{r_{jt}}{1 - r_{jt}} \right)$. This transformation is common in the retention rate or school participation literature. Retention rates should lie between zero and one and this transformation ensures that the predicted values lie in that range.
The first is via the proportion of 12 year olds in the Year 8 cohort. This variable picks up the phased implementation of the policy. The more common approach taken in the literature is to capture a policy change through an indicator variable which takes the value one in the jurisdiction affected (South Australia) after the date of effect of the policy change (from 1994), and zero otherwise. The results where this approach is used are also reported.

The assumption that the time effects were fixed (that external factors - the $D_t$ - have identical effects in every jurisdiction) was also relaxed. These were replaced with economic variables of the kind economists have used to explain school participation or retention in Australia. This literature is summarised in Appendix 3.5 and the results presented there (Table 3.5.2). The main specification includes variables that capture state unemployment to pick up the economic cycle, real adult wages to reflect parental capacity to support students, and the proportion of school students who work part time, which reduces the cost of education by lowering foregone income. Experiments with alternative economic variables, such as including the percentage change in total full-time employment to cover cyclical factors, or the full-time employment to population ratio for 15-19 year olds to pick up their job opportunities, had very little impact on the estimated policy effects (and in some cases increased them marginally).

### 3.7 Results

#### 3.7.1 Base case results

The first column of Table 3.2 contains the ‘differences in the differences’ estimates using the Year 12 retention rates already reported in Table 3.1. The comparison is between the change in South Australian Year 12 retention rates from 1991-93 to 1997-99 and the unweighted

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28 There are other ways of characterising differences in the age distributions of cohorts, but their inclusion does not change the results. Since the proportion of students is the most intuitive measure, it is the one used here.

29 More complex modelling approaches are also possible. Karmel (1995) estimated two equations: one for retention to Year 11 and a second for the progression of students from Year 11 to Year 12. A related sequential decision-making approach was also modelled here: the first decision was whether to leave school before the start of Year 11, followed by a decision to leave before Year 12, with the outcome of the first decision influencing the second. The proportion of students aged 12 in Year 8 influenced the proportion of the cohort leaving at both times.
average of the seven other Australian jurisdictions. The South Australian rate fell by 19.8 percentage points, compared to an average fall of 1.2 per cent for the other Australian jurisdictions, a difference in the difference of 18.6 per cent. The standard deviation for the changes in retention in the other jurisdictions was 3.8 percentage points. The fall in retention in South Australia over the period was clearly significantly different from that experienced in the other Australian jurisdictions.

The second column of Table 3.2 contains difference in the difference estimates where changes in retention rates between 1993 and 1996 are compared. The first year is the year before the 1985 Year 3 cohort reached Year 12. Since the evidence of Figure 3.3 suggests that the ageing of grade cohorts took place over a few years following the policy change, three years are allowed to measure its full effect. The difference in differences estimate for the changes between those years is again significantly different from zero.

The lower half of Table 3.2 contains the estimated effect of the policy change based on the parameters of a series of regression equations designed to explain changes in Year 12 retention rates. The alternative specifications involve first, variations in how the effect of the Early Years of School policy change is picked up: as a dummy variable that takes the value one in South Australia from 1994 (inclusive) or as the proportion of the cohort aged 12 in Year 8. Where the latter variable is used, the smaller estimated effect on retention between 1993 and 1996 reflects the smaller change in that variable over that period than occurred between 1991 and 1999. The full set of results for these formulations appear in Appendix 3.5. The second variation involves differences in how the time effects are captured: through a series of dummy variables for each year or through the inclusion of a small number of

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30 The weighted average for the other jurisdictions was – 0.3.

31 The estimated policy effects in the lower half of Table 3.2 are based on regression equations. They were generated as follows: they are approximated by \((\partial r/\partial x) \Delta x\), where \(x\) is the explanatory variable, the proportion of the cohort aged 12 in Year 8. This proportion changed by 25 percentage points (the \(\Delta x\)) between 1993 and 1996 and 39.5 per cent over the entire period. With the logistic transformation of the dependent variable, the marginal effect is given by \(\partial r/\partial x = r^*(1 - r^*) \beta\), where \(r^*\) is the average value of \(r\) in all jurisdictions in the relevant period (0.677 between 1993 and 1996 and 0.679 over the whole period) and \(\beta\) is the coefficient on \(x\) from the relevant equation in Tables 3.5.1 and 3.5.2. The estimated marginal effects were about 10 per cent lower when \(r^*\) was based on the South Australian average over the relevant periods.
‘economic’ variables. As previously indicated, the economic variables included state unemployment rates, real adult wages and the proportion of school students who work part time.

Table 3.2: Estimated effect of the implementation of the Early Years of School policy in South Australia

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Change in retention</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>-19.8</td>
<td>-15.4</td>
</tr>
<tr>
<td>Rest of Australia</td>
<td>-1.2</td>
<td>-1.7</td>
</tr>
<tr>
<td>(standard error)</td>
<td>(3.81)</td>
<td>(3.07)</td>
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<tr>
<td><strong>Difference in Differences</strong></td>
<td>-18.6</td>
<td>-13.7</td>
</tr>
<tr>
<td><strong>t-statistic (a)</strong></td>
<td>(-4.87)</td>
<td>(-4.45)</td>
</tr>
</tbody>
</table>

Regression results (estimated policy effect from alternative specifications and ‘t’ statistics)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Time dummy variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy dummy variable</td>
<td>-13.3</td>
<td>-13.3</td>
</tr>
<tr>
<td>(standard error)</td>
<td>(-5.78)</td>
<td>(-5.78)</td>
</tr>
<tr>
<td>Proportion aged 12 in Year 8</td>
<td>-16.8</td>
<td>-9.2</td>
</tr>
<tr>
<td>(standard error)</td>
<td>(-8.40)</td>
<td>(-8.40)</td>
</tr>
<tr>
<td>Economic variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy dummy variable</td>
<td>-13.8</td>
<td>-13.8</td>
</tr>
<tr>
<td>(standard error)</td>
<td>(-5.70)</td>
<td>(-5.70)</td>
</tr>
<tr>
<td>Proportion aged 12 in Year 8</td>
<td>-15.1</td>
<td>-9.6</td>
</tr>
<tr>
<td>(standard error)</td>
<td>(-7.18)</td>
<td>(-7.18)</td>
</tr>
</tbody>
</table>

(a) The critical value from the ‘t’ distribution with 6 degrees of freedom at the 95 per cent level (one tailed) is 1.94. Hence, the difference in difference estimates are significantly different from zero at the 95 per cent significance level.
In the regression results, the coefficient on the policy dummy variable is negative and significantly different from zero in the estimated equations (see Table 3.5.3 of Appendix 3.5). Its magnitude suggests that the policy lowered retention by about 13 percentage points in South Australia. However, the specification assumes that the implementation of the policy was completed in just one year, which is not consistent with the slower way the grade cohorts aged. Therefore, results based on the measure of the proportion of students aged 12 in Year 8 are also reported and are given more emphasis in subsequent discussion. The coefficient on that variable is positive and significantly different from zero in all equations. Since the policy reduced the proportion of students aged 12 in Year 8 in South Australia, the results confirm the ‘difference in the differences’ finding that the policy’s effect was to reduce Year 12 retention in South Australia. The estimated effects are quite close to those of the difference in difference results and do not vary much depending on whether the economic or the time dummy variable specification is used.

The results support the proposition that the effect of the ageing of the grade cohorts had a pronounced effect on Year 12 retention in South Australia. However, there was no specific South Australian effect on the estimated parameter for the proportion of students aged 12 in Year 8. An interaction term between that variable and the South Australian dummy variable was insignificant in both the economic and the time dummy variable specifications. Moreover, there was no evidence of any ‘Icarus’ effect – that retention fell so much in the mid-1990s in South Australia because it had previously risen so much. Interaction terms between the proportion of students aged 12 in Year 8 and either the difference in state retention rates in 1990 from the national average or the change in retention between 1982 and 1990 were not significant and had no effect on the coefficient on the proportion of students aged 12 variable. Where the jurisdiction-specific factors, the $\alpha_j$, were allowed to be different from 1994 onwards from their previous values, the coefficient on the proportion of students aged 12 in Year 8 fell by about 25 per cent, but remained significantly different from zero.

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32 The absolute value of the ‘t’ statistic was about 0.2 in both equations.
33 The variables and their interaction with the proportion aged 12 variable were neither jointly nor separately significant.
34 The coefficient on the change in the South Australian-specific factor was negative, but not significantly different from the comparison state, Western Australia. It was significantly different from some other jurisdictions, however. This formulation is akin to allowing policy change variables in all jurisdictions from 1994 onwards. Where both policy variables were
3.7.2 Year 12 repetition and part-time enrolments

Two approaches were also adopted for dealing with Year 12 repetition and part-time Year 12 enrolments. These two variables are not covered well in the data used, but were identified as potential influences on measured retention in Section 3.5. First, estimates of these variables were used as explanatory variables in the retention equation already described. Second, those estimates of the variables were used to adjust the dependent variable. The latter approach has the virtue of putting any measurement error in the dependent variable, removing one source of bias from the parameter estimates.

The estimate of Year 12 repetition was obtained by subtracting from the overall Year 12 retention rate the retention rate for the dominant cohort age or age groups in jurisdictions. Since repetition will largely result in additional students who are older than the dominant cohort age group being included in the aggregate Year 12 retention rate, subtracting the retention rate for that group from the aggregate figure provides an estimate of the magnitude of repetition. The approach and its outcomes are described in more detail in Appendix 3.5.

The proportion of the original Year 8 cohort studying Year 12 part time in jurisdictions was also estimated. The estimates are based on published ABS data from 1995 for total part time students in Year 12 in jurisdictions and numbers reported in another government publication for 1994.35 It is assumed that part time students increased linearly from 1991 to 1994 from zero in each jurisdiction in 1991. However, the age of the part time students is not published. Therefore, it was assumed that one third of part time students in Year 12 in any calendar year ‘belong’ to the relevant Year 8 cohort.36 Once more, the approach is described in more detail in Appendix 3.5.

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35 These were reported in Steering Committee for the Review of Commonwealth/State Service Provision (SCRCSSP 2000).

36 The regression results were not sensitive to this assumption.
The regression results in Appendix 3.5 confirm that Year 12 repetition has a positive and significant effect on retention. The results suggest that the decline in repetition between 1992 and 1996 contributed about three percentage points to the fall in retention rates in South Australia. The regression results do not suggest that part time Year 12 enrolments affected retention rates. The coefficient on the part time variable was typically negative, but was never significantly different from zero. While this outcome may reflect measurement error, attempts to instrument for part time enrolments using a time trend and dummy variables for the introduction of SACE in South Australia and the Northern Territory and similar ‘Certificates’ in Victoria and Tasmania had no effect on the results. These variables were used because part time student numbers trended up over the period and the introduction of the certificates were seen as having facilitated part time study in senior school.37

If both Year 12 repetition and the growth in part time Year 12 students affected South Australia differently from other jurisdictions, these effects mean that measured retention is likely to differ from jurisdictions’ ‘true’ retention outcomes. The measure of Year 12 retention was therefore adjusted to take these issues into account. In the first case, the estimate of Year 12 repetition is subtracted from Year 12 retention to derive repetition-adjusted Year 12 retention rates. In the second case, an estimate of part time Year 12 enrolments was added to the repetition-adjusted Year 12 retention rates.

The effect of excluding repetition is to moderate the decrease observed in Year 12 retention in the early 1990s and push retention higher at the end of the 1990s than it was at the start in most jurisdictions. Figure 3.8 shows the effect of this adjustment on estimates of retention in South Australia over the 1990s.

First, the base estimates are compared with the Year 12 repetition-adjusted rate, which always lies below the base rate. At the peak retention rate in 1992 in South Australia, Year 12 repetition contributed about 10 percentage points to the total. The estimates suggest that Year 12 retention did not change much after its fall between 1994 and 1996. Where the

37 The instruments had acceptable properties. The Wald statistic of their joint significance in explaining part time Year 12 enrolments was 122.8 compared to a critical value of 9.49 and a Sargan (1976) test statistic of the overidentifying instruments was 6.56 compared to a critical value of 7.82.
estimate of the number of part time students are added to the repetition-adjusted series it has a similar pattern, that Year 12 retention in South Australia was largely unchanged after 1996.

**Figure 3.8: Alternative estimates of Year 12 retention in South Australia: 1991 – 1999 (per cent)**

The re-estimated ‘difference in the differences’ calculations and regression results with these alternative retention measures are reported in Table 3.3. Once more, the decline in Year 12 retention in South Australia between the beginning and end of the 1990s was significantly different from the changes observed in other jurisdictions. For the shorter period, between 1993 and 1996, the change in the repetition-adjusted retention rate was significant, while the estimate for the difference when part time students are included was not quite significant.\(^{38}\)

Where these two measures of retention were used as alternate dependent variables in the regression equation, the ageing of the grade cohorts continued to have a pronounced effect on Year 12 retention in South Australia. These results are summarised in the lower section of Table 3.3, where this time only the estimated policy effects from the variable measuring the proportion of students aged 12 in Year 8 are reported. Once more, the coefficient on this variable was positive and significant in all equations, which are reported more fully in Appendix 3.5.

\(^{38}\) The standard error of the estimates for the rest of Australia was higher here, seemingly affected by the figures for the ACT, which showed a surprising increase in repetition in 1995 in its estimates. This effect had disappeared by 1999.
Table 3.3: Estimated effect of the implementation of the *Early Years of School* policy in South Australia on adjusted retention

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Difference in differences estimates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in retention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetition adjusted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>-9.7</td>
<td>-10.2</td>
</tr>
<tr>
<td>Rest of Australia</td>
<td>0.2</td>
<td>-2.0</td>
</tr>
<tr>
<td>(standard error)</td>
<td>(4.66)</td>
<td>(3.68)</td>
</tr>
<tr>
<td>Difference in Differences</td>
<td>-9.9</td>
<td>-8.2</td>
</tr>
<tr>
<td>t-statistic (a)</td>
<td>(-2.13)</td>
<td>(-2.22)</td>
</tr>
</tbody>
</table>

| Part time included                   |                     |              |
| SA                                   | -8.1                | -9.0         |
| Rest of Australia                    | -0.5                | -1.4         |
| (standard error)                     | (3.09)              | (3.98)       |
| Difference in Differences            | -7.6                | -7.6         |
| t-statistic (a)                      | (-2.46)             | (-1.92)      |

| Regression estimates and ‘t’ statistics|                     |              |
| Repetition adjusted                  |                     |              |
| Time dummy variables                 | -13.0               | -8.2         |
|                                      | (-6.32)             | (-6.32)      |
| Economic variables                   | -13.9               | -8.8         |
|                                      | (-6.17)             | (-6.17)      |
| Part time included                   |                     |              |
| Time dummy variables                 | -11.6               | -7.3         |
|                                      | (-7.41)             | (-7.41)      |
| Economic variables                   | -11.0               | -7.0         |
|                                      | (-5.95)             | (-5.95)      |

(a) The critical value from the ‘t’ distribution with 6 degrees of freedom at the 95 per cent level (one tailed) is 1.94. Hence, with one exception, the difference in difference estimates are significantly different from zero at the 95 per cent significance level.
3.7.3 The ‘construct validity’ problem – alternative explanations of the results

The results presented to date seem to support the proposition that the change in junior school progression policy in South Australia in the mid-1980s lowered retention rate outcomes in that state in the mid-1990s. The regression analysis contained controls for three education-related factors that have been identified as potential causes of the decline in retention in Australian jurisdictions: vocational education and training alternatives to school, Year 12 repetition, and part time study. Part of the decline in retention in South Australia was caused by a reduction in repetition, but growth in part time study did not appear to have had a major effect on the decline in Year 12 retention. If anything, TAFE participation fell over the relevant period in South Australia, rather than attracting students away from school. The effect of the ageing of the grade cohorts on Year 12 retention dominated these various effects. In the regression equations, at least some economic variables that affected retention were identified. Therefore, it seems unlikely that some factor other than the ageing of the grade cohorts was the major cause of the fall in retention in South Australia.

However, it is possible that some explanation other than screening theory is the reason why the ageing of the cohort lowered retention in South Australia. Three other possible candidates might explain the observed fall in retention.

The first has been described already – that while those individuals forced to undertake an additional year of junior school might have left one grade earlier than they would have, they could have undertaken the same years of schooling. Therefore, the observed lower retention outcomes for South Australia may reflect no change in individual decision-making or behaviour.

A second potential explanation is that individuals have a target age at which they leave school. This behaviour may be confined to individuals of some specified type, notably those of below average ability. This target age might be based on family expectations, the prior behaviour of siblings or from neighbourhood norms. If school leaving is based on such target ages, this would explain why individuals were observed to leave at lower schooling levels following the introduction of the *Early Years of School* policy.

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39 Heath (1999) finds evidence of such endogenous neighbourhood effects on school completion decisions in Australia, though the results are also consistent with the existence of screening or signalling effects.
The problem with both of these arguments is an empirical one: only about 40 per cent or so of the grade cohorts were affected by the policy change. To bring about a 15 percentage point fall in aggregate retention rates, this group must have been 40 percentage points less likely to complete Year 12 than the 60 percent whose decision-making should have been unaffected by the policy change. Such a difference between the groups who simply happen to have been born at different times of the year does not seem plausible.\footnote{Moreover, if individuals do have target ages, what information about labour market outcomes associated with different school leaving ages sustains these target ages? If 16 years is some target, (that is, you can get a ‘good’ job at 16), it can only be because leaving at 16 is ‘better’ than leaving at 15, and 17 is ‘better’ than 16 and so on. But this argument seems to be just an age-based version of the signalling model, where the age at leaving is the signal sent by individuals to employers to identify the ability type to which they belong.} Put another way, the difference in the differences estimates of the change in retention reported in Table 3.2 would still be significant if the estimated human capital ‘years of schooling’ effect of 4 to 5 percentage points calculated in sub-section 3.5.4 were subtracted from the change in retention in South Australia.

The third possible explanation for the results is that individuals are influenced by the education decisions of others, but not necessarily in the way screening or signalling theories posit. The policy change may have allowed early leavers to finish their schooling at a lower level than they had previously. However, other individuals might be motivated by peer effects or some social ‘distancing’ or mirroring phenomenon, as discussed in Akerlof (1997), so that their education choices do not diverge too much from the early leavers. These motivations may have caused these individuals to lower the level of schooling they would otherwise have obtained, generating the lower retention rate observed in South Australia. This explanation begs the question of why such individuals need any ‘distance’ between themselves and the early leavers, once more allowing some role for screening in individuals’ decision-making processes. Another response is to look for any other evidence on the operation of screening that arose from this policy change.

One source of further information is what happened to university commencements by school leavers in South Australia over this period. Lang and Kropp (1986) argued that the effect of changes in compulsory schooling should ‘ripple’ through the schooling decisions of others. In this case, the argument suggests that the effect of the Early Years of School policy change...
should lower university participation by grade cohorts. In fact, the opposite occurred in South Australia in the mid 1990s.

However, the higher education system expanded substantially in Australia from the late 1980s to the mid-1990s. The period could reasonably be characterised as one where constraints on the provision of university places diminished or disappeared. That is, the market conditions broadly reflected the situation Bedard (2001) attempted to model. In Bedard’s signalling model, relaxation of a constraint that prevented some high school graduates from attending university induced lower levels of high school completion.

Additional regression analysis provided only modest evidence of such an effect in Australia over this period. A variable designed to capture individuals’ expectations about the likely availability of university places was added to the Year 12 retention equation. This variable was the proportion of the previous grade cohort who entered university immediately after completing school. While the coefficient on this variable was negative, its ‘t’ value was only 1.5 and hence was not significantly different from zero at conventional levels of significance.

In the absence of evidence that supports screening, another approach is to look for evidence that might support the role of peer or neighbourhood effects at the time. This approach involves testing whether the decline in Year 12 retention in South Australia was confined to individuals from low socio-economic backgrounds. Early school leaving is more prevalent among individuals from such backgrounds (see Lamb 1996, Marks and Fleming 1999 and Lamb et al. 2000, for example) and hence more likely to generate and support some ‘norm’ for other group members. If however, the decline affected all social groups, it would support the idea that some factor other than one directly linked to SES was responsible for the fall, such as the mechanism suggested by screening theories.

The DETYA completion rate data described in Section 3.4 mirror the fall in Year 12 retention in South Australia relative to the other States, though the decline in completion rates commenced later (after 1994) than in the retention rate series. The fall in completion between 1993 and 1996 in South Australia was greatest among those from low socio-economic backgrounds (a 15 percentage point fall), though it was also quite apparent among those from high socio-economic backgrounds (a 9 percentage point fall). Regression

41 The ‘t’ value of the difference in differences estimate for the change in South Australian completion rates between 1993 and 1996 compared to the rest of Australia was –3.79.
equations that used completion rates for ‘high’ and ‘low’ SES groups by jurisdiction as the dependent variable gave very similar results to those already presented for Year 12 retention. The coefficient on the proportion of Year 8 students aged 12 was positive and significant in all equations. Moreover, a test that the marginal effect of the proportion aged 12 variable on school completion was identical for both ‘high’ and ‘low’ SES groups could not reject that possibility. That is, both high and low SES groups were estimated to lower their levels of school completion in a similar way in response to the ageing of the grade cohorts. The results support the conclusion that the decline in school completion occurred across students from all social backgrounds in South Australia.

Since the decline in completion and, presumably, retention was so broadly based in South Australia, it seems unlikely that the observed fall in retention in South Australia arose solely from some form of peer or social distance effect. A screening or signalling explanation of this phenomenon is that the earlier school leaving allowed by the policy change induced other individuals of below average ability, across all social groups, to lower their schooling in South Australia.

3.8 Implications and conclusions

Based on the evidence in this Chapter, school retention in South Australia fell significantly more than in other Australian jurisdictions in the mid 1990s. This decline was confirmed in the DETYA school completion data. The most convincing explanation for the cause of this decline was a policy change that slowed student progression through junior primary school after the mid 1980s. This was the most convincing explanation because it fitted the timing of the fall in retention and its nature, since more students left at all levels of school prior to Year 12. Also, because the decline in school completion occurred across different SES groups, it appears that it was not solely the outcome of some type of peer effect.

42 ‘High’ SES is measured as the average of the top three SES deciles and ‘low’ the bottom three in the DETYA data. These regression results are not reported, since they correspond closely to those presented in Appendix 3.5. The exceptions to this statement are: that the effect of the economic variables is less marked on completion, though still evident; that the change in unemployment, rather than its level, had a positive effect on school completion; and that the number of part time students had a positive impact on school completions.

43 The Wald test statistic had value of 1.52 compared to the critical $\chi^2(1)$ value of 3.84.
Therefore, the major conclusion of this Chapter is that individuals behave in a strategic way in the labour market. This is consistent with the type of behaviour predicted by screening or signalling models of the role of education in labour markets where individual productivity is difficult to observe. Therefore, it seems reasonable to conclude that screening models do characterise at least some elements of the decision-making processes of individuals. This does not mean that education is not productive, however. These results do not shed light on that issue.

The second conclusion is that it is possible to influence Year 12 retention by persuading early leavers to stay one additional year or by changing minimum schooling requirements. The change in retention following the ageing of the grade cohorts in South Australia highlights the continuing ‘time-serving’ element of school education for many young people, despite the broadening of senior school curricula that has taken place since the mid 1980s. Given the chance to leave at an earlier grade, many did. The revealed preferences of young people towards schooling argue against changes to compulsory schooling legislation, however.

Third, Western Australia is in the process of changing its school entry arrangements. It will incorporate its current Pre-primary year into its school structure and attendance in that year will rise from four days to five days per week. The effect of the changes is to move from a twelve to a thirteen year schooling structure from 2002.44 It is also changing the birth cut-off dates that determine when children can enter the education system. Grade cohorts presently consist (mostly) of children born in the same calendar year in Western Australia. In the future, they will consist (mostly) of children born in the same financial year. The effect of change will be that the grade cohort that enters the Pre-primary classes in 2003 will be about half a year older than the 2001 cohort.45 The results presented here suggest that the same kind of reduction in Year 12 retention as observed in South Australia should be expected in Western Australia after 2013, in the absence of other interventions.

The final implication is that the mid 1990s in South Australian may provide a natural experiment that allows research on other education-related issues. The various policies

44 See ABS, Schools Australia 1999, (Cat No 4221.0) Explanatory Notes, Paragraph 5.
45 These changes are described at the website of the Education Department of Western Australia at: http://www.eddept.wa.edu.au/centoff/ece/info3.htm. Children born between 1 January and 31 December 1996 will enter Pre-primary in 2001; between 1 January and 30 June 1997 in 2002; and between 1 July 1997 and 30 June 1998 in 2003.
followed in South Australia have added three sources of variation in schooling to those found in other Australian jurisdictions. First the continuous enrolment policy means that many individuals complete fractional years of schooling that depend on when in the year they were born. Second, South Australia changed its policy in a way that led a substantial proportion of individuals to lower their educational attainment relative to their predecessors and their counterparts in other jurisdictions. This different behaviour should be reflected in the various data sets that make up the Longitudinal Surveys of Australian Youth, for example, and the policy change should provide a good way of identifying the effect of varying levels of education on issues of interest. Third, while more young people were leaving school at lower levels than had previously been possible in South Australia, more members of each grade cohort went to university. That is, the distribution of educational attainment widened in South Australia compared to other Australian jurisdictions in the 1990s. The implementation of the Early Years of School policy in South Australia therefore provides a nice natural experiment that may be useful in analysing the effect of school education on other phenomena of interest. The benefits of such natural experiments lie in the simplicity of the approaches that can be used to analyse them.

The evidence from this episode also suggests that quarter of birth and its interaction with school starting arrangements and minimum school leaving age legislation is as pertinent in Australia for educational attainment as it is in the United States. This suggests an approach that mirrors that of Angrist and Krueger (1991), who used quarter of birth as an instrument for years of schooling in estimating the effect of education on wages, may also be of value in Australia. Such an approach requires that data sets contain information on quarter of birth and the states where individuals received their school education. However, variations in school starting arrangements across Australian jurisdictions would add to the complexity of this approach.
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