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THE ECONOMICS OF CURRICULUM PROVISION FOR YEARS 11 AND 12

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This paper analyses the allocational decisions that have been made concerning Years 11 and 12 programs in Australian government school systems. It is drawn from a wider study of how system and school decision makers attempt to meet, within a tight financial context, the increased curriculum demands of a more diverse student body. The study, which was based on samples of schools from four Australian government school systems in 1990, was concerned with the inter-relationship of decisions taken at the system and school levels. It was conducted in conjunction with Ross Harrold and Marian Stone from the University of New England, and much of this paper draws on their analyses. The research was supported by a grant from the Australian Research Council.

CONTEXT

Between 1980 and 1990 the proportion of commencing students in Australian government secondary schools who were retained to Year 12 more than doubled, from 28 per cent to 58 per cent (DEET, 1991). This unprecedented rise in retention rates meant that over the past 10 years the number of Years 11 and 12 students in government schools has increased much faster than junior secondary enrolments. As Table 1 shows, the number of senior or Years 11 and 12 students rose by 63 per cent between 1980 and 1990, while the number of junior secondary students (Years 7/8 to 10) actually declined by 5 per cent. As a result, the proportion of government school secondary students enrolled in Years 11 and 12 increased from 19 per cent in 1980 to 29 per cent in 1990. In quantitative terms at least, Years 11 and 12 students became a much more significant component of Australian government secondary schools during the 1980s.

Over the same period teacher numbers in government secondary schools increased slightly faster than student numbers, causing the student-teacher ratio to decline from 12.2 in 1980 to 12.0 in 1990 (see Table 1). On the surface, this might suggest that government secondary schools were in a stronger resource position by 1990 than a decade earlier. However, the position is more complicated than this since

Years 11 and 12 students generally require more teacher resources per capita than junior students. In general, senior students are generally provided with opportunities to study a more comprehensive curriculum than students in the junior year levels. This translates into smaller class sizes in Years 11 and 12 and, therefore, more teachers per student.

It can be calculated that if the teacher resource differential between senior and junior students was 25 per cent in 1980 (i.e. if senior students were allocated 25 per cent more teachers per capita than junior students), and the differential remained at this level during the 1980s, then the increase in overall teacher numbers shown in Table 1 would be 'about right'. On this assumption, the increase of 96,000 in senior student enrolments would have required about 10,000 additional teachers, while the 36,000 fewer junior students would have required about 3,000 fewer teachers. The net result is that the different patterns of enrolment growth would have necessitated about 7,000 additional teachers between 1980 and 1990, a figure that is close to the extra numbers that were actually employed. However, if the teacher resource differential in favour of senior students was greater than 25 per cent, then the growth in teacher numbers in teacher numbers during the 1980s would have been insufficient to maintain the pattern of curriculum provision. Among other things, the present study provides updated estimates of the size of this differential.

The rapid rise in school retention rates has not only increased the numbers of Years 11 and 12 students, it has also led to substantial changes in the composition of the senior secondary population. The most rapid rise in school retention rates during the 1980s tended to occur among student groups who have traditionally been under-represented in Years 11 and 12, most notably students with relatively low levels of performance in primary and junior secondary schooling (Ainley & McKenzie, 1991). This suggests that schools are now having to deal with a senior secondary student population that is much more heterogeneous in background, interests and abilities. The changing composition of the senior secondary student body has prompted, and perhaps been stimulated, by the curriculum reforms adopted by all Australian government school systems from the mid-1980s onwards. Those reforms have attempted to respond to an increasingly heterogeneous senior student population by providing more comprehensive curricula in Years 11 and 12. This study analysed the ways in which those curricula have been provided in different school systems and schools of different sizes.

At the system level the study sought to understand what study load demands were placed on Years 11 and 12 students by curriculum authorities and what formulae were used to allocate teachers to schools. The main research focus was at the school level, in studying the economic problem of how school administrators tried to meet the curriculum demands of Years 11 and 12 students in schools of different sizes, and within the constraints set by teacher numbers and the

requirements of industrial awards and agreements. A third, implicit, purpose was to demonstrate ways in which data routinely collected from schools for routine administrative purposes can provide important analytical insights useful for review and planning.

METHOD

The project developed a model which showed the inter-relationships between decisions taken at the levels of the school system and the individual school. Few other studies have been able to incorporate a multi-level perspective despite the wide recognition that such an approach is essential for the analysis of school resource allocation (Barro, 1989). The model first identified the range of decision makers and their areas of decision-making responsibilities in government school systems. It then traced how the teacher resources supplied to schools are translated into the curriculum services provided to students (see Figure 1). The model made explicit the factors that shape a school's program at each of a number of allocational decision points, and thereby identified the areas that lie within a school's decision-making domain and those that are largely outside the direct influence of the individual school. Matters which were resolved at levels external to the school site include the mandated syllabus and certification requirements for Years 11 and 12 students, staffing formulae that determine the number and mix of teachers, and industrial agreements concerning the length of the school day, week and year, teachers' face-to-face teaching hours, and class sizes. These factors, together with site decisions about period length, timetable structure and remissions from teaching duties, determine the total number of class groups that a school is able to form for teaching purposes. The school's discretion comes into play further in distributing these class groups between different curriculum areas and year levels.

The model was applied to substantial official data sets on the 1990 operations of 72 sample schools drawn from four government school systems (24 from New South Wales, 24 from Victoria, 16 from Queensland, and 8 senior colleges in the Australian Capital Territory). These four systems were chosen to maximise the amount of variation in regard to curriculum and staffing policies, the structural organisation of Years 11 and 12, and school size. In NSW, Victoria and Queensland the schools were sampled to ensure a spread of senior school enrolment sizes. The small number of schools in the ACT meant that it was possible to include all of the senior colleges in the study, although in the end one school had to be excluded because its data were not available in suitable form.

The data sets enabled the analysis of within-school patterns of curriculum provision and teacher deployment at a more disaggregated level than is generally possible in this field. Table 2 provides an example of the indicators and detail that could be extracted from these data sets, in this instance the data relating to a group of medium-sized

secondary schools in Queensland.

The major structural difference between the systems is that in the ACT Years 11 and 12 programs are provided in separate senior colleges, while in the other systems almost all senior students are catered for in schools that span from Year 7 to Year 12 (Year 8 to Year 12 in Queensland). This structural difference is reflected in average school size among the sample schools (see Table 3). As can be seen, on average the ACT senior colleges enrolled more than twice the number of Years 11 and 12 students than schools in the other three systems. The sample schools in Victoria were particularly small compared to the other three systems.

The project used a numerical method of categorising school curricula derived from Monk (1987) to describe the patterning of offerings to meet the varying needs of students. Three levels of categories were used: breadth (the number of broad curriculum areas covered), depth (the average number of subjects offered per curriculum area) and access (the number of times the same subject was offered in a school's timetable). To supplement the measure of access defined above it is possible to use the the number of singletons provided by a school. A singleton is a subject that is offered through only one class group. The higher the proportion of singletons in the curriculum the less likely it is that students will be able to enrol in subjects of their choice. This taxonomy permitted the identification of variations in the 'trade-offs' made by school decision makers, given the finite number of classes that they could form. These trade-offs were essentially between offering a 'broad' curriculum with a large number of different subjects but with most of those subjects being offered only once or twice on the timetable, or keeping to a 'narrow' curriculum and providing greater access to the subjects that are offered. The research analysed the extent to which schools of similar size and structure differed in the allocative decisions that they made.

To provide a common basis for comparison between the school systems, study used the system of curriculum classification developed by Ainley et al (1990) for a national study of subject choice. This system classifies subjects into 14 broad curriculum areas: English; Mathematics; Economics and Business; Physical Sciences; Biological and Other Sciences; Computer Studies; Technical Studies; Physical Education; Creative and Performing Arts; Humanities and Social Sciences; Agriculture; Languages Other Than English; Home Science; and Other. These 14 areas correspond to the breadth dimension outlined above: a school that provided subjects in each area would be considered to offer a broader curriculum than a school with (say) subjects from 10 areas.

RESULTS

Of the four systems the ACT provided its schools with the greatest degree of autonomy: the ACT senior colleges had considerable freedom to determine curriculum offerings and the mix of their staffing allocations. This autonomy was reflected in substantial variation among ACT colleges in the structure of their curriculum provision (see Figure 2). For example, the colleges differed markedly in the priority that they accorded to the Creative and Performing Arts (curriculum area 7). In College A1 the relatively number of teacher hours allocated to this area relative to student hours was cross-subsidised by relatively few teacher hours in the areas of English and Mathematics. By contrast, in College A4 the pattern of subsidisation was more evenly spread between curriculum areas. Such variation could not be explained by differences in enrolment size since the colleges are very similar in this regard. However, even within the more centralised systems otherwise similar schools showed variations in the patterns of their curriculum provision and teacher deployment (for example, see schools Q8 and Q10 in Table 2). These between-school differences suggest that schools do seek to be responsive to local circumstances and needs.

The systems placed different sorts of curriculum requirements on their schools. For example, in Queensland and the ACT there were no compulsory subjects for students to study. As a consequence, in schools in these two systems there tended to be comparatively less variation between different curriculum areas in average class sizes. By contrast in Victoria and NSW classes in the compulsory subjects tended to be markedly larger than subjects in the elective curriculum areas. In Queensland as well, students were generally required to have fewer hours of face-to-face class contact per week with teachers than in the other systems. This had the effect of enabling Queensland schools, which on average had higher student-teacher ratios than the other systems and a slightly shorter teaching week, to provide a more extensive curriculum range than would have otherwise been the case.

A particular focus of the study was the effect of school size on curriculum provision. As anticipated, it was found that the staffing formulae provided proportionately more teachers to small schools: the teacher-student ratio declined, at a decreasing rate, as school enrolments increased. This policy was intended to allow small schools to provide a curriculum that was reasonably comparable with that provided by larger schools. The objective was largely achieved with regard to the breadth of the curriculum in Years 11 and 12. Of all the dimensions of curriculum structure considered in the study, this was the least influenced by school size (see Table 4 for Victorian results). Size had a much more marked impact on curriculum depth and access. This impact was particularly evident in the ACT senior colleges, which were almost double the size of the Years 11 and 12 component of even the largest schools in the other systems. The ACT colleges were able to provide substantially more subjects within each broad curriculum area (i.e. depth) than schools in other systems, even though the colleges

generally had fewer teachers per student in the senior year levels than schools in NSW and Victoria. Interestingly enough, in overall terms there was little difference between the systems in access, that is, the number of class groups formed per subject or unit. Thus, whatever the school system on average any student had about the same chance of being able to enrol in a subject that was provided by the school, given the likelihood of timetable clashes.

There was some evidence, though, that in systems other than the ACT the curriculum advantages associated with larger schools started to plateau once schools passed a certain enrolment size: beyond that level schools started to offer 'more of the same' rather than a curriculum that was genuinely more comprehensive. The enrolment size at which this effect was evident varied from system to system, and was influenced by the interaction of mandated curriculum requirements and staffing policies.

The attempt by small schools to offer a senior curriculum that was reasonably broad in scope involved some cross-subsidisation of the program in Years 11 and 12 by the formation of relatively large classes in the junior year levels. In general, the larger the school the smaller the extent to which cross-subsidisation was required (see Table 5), although there was considerable variation between schools in each size category. School decision making over the use of available teacher time was clearly a significant factor in determining the degree to which the junior school supported the curriculum offerings made available to senior students.

The staffing formula for NSW secondary schools weights enrolments in Years 11 and 12 more heavily than those in Years 7 to 10. Table 5 attempts to apportion the extent of cross-subsidisation of Years 11 and 12 between the effects of the staffing formula and other factors that are more school-based in nature. Strictly speaking, all of the cross-subsidisation that occurs results from school-based decisions. Schools are under no compulsion to use only the teaching resources that are notionally allocated to Years 11 and 12 via the staffing formula in those year levels. However, an examination of the extent to which schools have subsidised Years 11 and 12 over and above the level inherent in the staffing formula provides some indication of whether the weighting in the formula may need to be adjusted. Not only was the extent of cross-subsidisation generally greater in small schools, but the part which was due to the weighted staffing formula was also greater in those schools. This reflected the fact that the formula provided small schools with a higher level of weighting for Years 11 and 12 students. The fact that Years 11 and 12 students generally had less time in class per week than Years 7 to 10 students accounted for only a fairly small part of the cross-subsidisation of the senior year levels.

Another perspective on cross-subsidisation is provided by comparing average class sizes in the junior and senior year levels of the school. Average class size (ACS) is calculated from the total number of student

hours in classes divided by the number of teacher hours allocated to FTF teaching. On average, in the small NSW schools the ACS in Years 7 to 10 was 21.1, and that in Years 11 and 12 was 12.6 (see Table 6). In this group, therefore, on average each student in Years 11 and 12 classes was allocated 73 per cent more FTF teacher hours than each student in Years 7 to 10 classes. This differential declined, at a decreasing rate, as schools increased in size. On average in the medium-sized schools the differential in favour of Years 11 and 12 students was 45 per cent, and 35 per cent in the large schools. The ratio declined as schools got bigger because ACS in Years 11 and 12 increased at a faster rate than ACS in Years 7 to 10. Across the NSW sample as a whole the differential in favour of Years 11 and 12 was substantially more than the 25 per cent that was postulated earlier in the paper.

The existence of cross-subsidisation revealed by this analysis poses important questions for the equity of curriculum provision between students in different year levels. It also raises questions about whether the debate on educational provision is better served by policies which make the cross-subsidisation of Years 11 and 12 explicit (either through a structural separation of Years 11 and 12 as in the ACT, or through a differentiated staffing formula as in NSW) rather than the outcome of individual school allocational decisions.

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TABLE 1
Government Schools, Australia
Student and Teacher Numbers ('000)

	1980	1990	Growth
Junior Secondary	657	621	-5%
Senior Secondary	153	249	63%
Total Secondary	810	871	8%
Senior/Total Enrolment	19%	29%	
Teachers (FTE)	67	73	9%
Student:Teacher Ratio	12.2	12.0	-2%

TABLE 2
Queensland Sample Schools Data, 1990
(Medium Senior Enrolments)

School	Q7	Q8	Q9	Q10	Q11		
Enrolments							
Year 8	119	162	164	170	291		
Year 9	120	151	206	169	290		
Year 10	139	165	205	193	331		
Year 11	158	148	189	142	219		
Year 12	114	139	156	212	139		
Total	650	765	920	886	1270		
Years 11&12		272	287	345	354	358	
Years 11&12 (% of Total)				42	38	38	40 28

Teacher Numbers, and Face-to-face (FTF) Teaching Time Per Week

Teachers (full-time equiv.)	47.8	53.5	63.9	58.1	82.5
Student-teacher Ratio	13.6	14.3	14.4	15.2	15.4
Available Teacher Hours	1156	1292	1544	1404	1994
FTF Teacher Hours	690	797	930	944	1199
FTF Tchr Hrs (% of Available)	60	62	60	67	60
FTF Hrs to Yrs 11&12 (% of FTF)	45	45	41	45	33

Student Time in Class Per Week

Total Student Hours	14224	17247	19162	20166	28049	
Student Hrs in Yrs 11&12 (% of Tot)			41	38	36	40
29						
Yrs 8 to 10 Class Time (% of 24.2 Hrs)		92		92	89	94
90						
Yrs 11&12 Class Time (% of 24.2 Hrs)		88		95	82	95
94						
Overall Class Time (% of 24.2 Hrs)		91		93	86	94
						91

Year 11 Curriculum Structure

Classes per Week	63	67	57	64	76	
Breadth	14	12	12	13		
Depth	2.1	2.8	2.7	3.1	2.5	
Access	2.1	2.0	1.8	1.7	2.3	
Subjects	29	34	32	37	33	
Singleton Subjects		16	17	16	23	15
Singleton Subjects (% of Subjects)			53	50	50	62
						45

Cross-subsidisation to Years 11&12

i FTF Hrs to Yrs 11&12 (%)	45	45	41	45	33
ii Student Hrs in Yrs 11&12 (%)	41	38	36	40	
29					
Cross-subsidisation (i-ii)	4	7	6	5	4

Average Class Size

Average Class Size Yrs 8 to 10	22.3	24.2	22.6	23.3	24.8
Average Class Size Yrs 11&12	18.6	18.5	17.8	19.0	20.5

Average Class Size Overall	20.6	21.6	20.6	21.4	23.4
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TABLE 3
Sample Schools

Average Enrolment Size

	No. of Schools	Junior Students	Senior Students	Total Students	% Senior Students	
NSW	24	579	221	800	27.6%	
VIC	24	411	170	581	29.3%	
QLD	16	587	339	926	36.6%	
ACT	8	(692)	724	(703)	(35.6%)	

TABLE 4
Year 11 Curriculum Provision and Enrolment Size
Victoria, 1990

School	Year 11 Enrolment Groups	Subjects	Breadth	Depth	Access	Class (per cent)
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Smallest Enrolment Band

V1	15	10	10	1.0	0.9	90	8.5
V2	23	18	11	1.6	0.9	83	16.2
V3	24	15	10	1.5	1.1	73	16.4
V4	31	13	10	1.3	1.0	85	13.6

V5	31	24	11	2.2	0.7	58	17.5
V6	35	13	9	1.4	1.2	69	15.1
V7	50	15	10	1.5	1.1	67	16.6
V8	57	19	10	1.9	1.3	58	24.5
Average	33	16	10	1.6	1.0	73	16.1
Medium Enrolment Band							
V10	68	14	11	1.3	1.6	64	23.0
V9	72	22	11	2.0	1.1	73	25.2
V11	79	20	10	2.0	1.3	65	25.6
V15	81	15	11	1.4	1.6	60	24.4
V13	90	17	11	1.5	1.5	65	25.2
V14	92	17	10	1.7	1.6	59	27.0
V12	94	17	10	1.7	1.7	82	29.0
V16	114	20	10	2.0	2.0	40	40.2
Average	86	18	11	1.7	1.6	63	27.5
Largest Enrolment Band							
V18	155	21	11	1.9	1.8	48	38.3
V19	155	20	12	1.7	2.3	35	45.0
V17	168	29	14	2.1	1.7	62	49.0
V20	169	19	10	1.9	2.5	32	47.1
V22	174	20	10	2.0	2.4	40	47.7
V21	181	35	14	2.5	1.6	66	56.4
V24	182	22	11	2.0	2.5	36	55.3
V23	192	21	11	1.9	2.5	52	53.4
Average	172	23	12	2.0	2.2	46	49.0

TABLE 5
Cross-subsidisation of Years 11 and 12
NSW, 1990 (Average per Group of Schools)

Part of Cross-subsid
isation

of Years 11 & 12 Due
to:

% FTF	% Student	Cross-	Reduced	Other
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Scho ol	Hours to Yrs 11&12	Hours in Yrs 11&12	subsi- disation	Weighted Formula Load	Student Staffing	
Class	Allocation	(i)-(ii)		Decisi		
ons	(i)	(ii)				
Small Schools (N=8)	33	23	10	6	1	4
Medium Schools (N=9)	34	26	8	4	1	3
Large Schools (N=7)	36	30	6	3	1	2
Overall (N=24)	34	26	8	4	1	3

TABLE 6

Average Class Size NSW, 1990

(Average per Group of Schools)

	Average Class Size in Years 7 to 10		Average Class Size in Years 11 and 12		Rat
io	(1)	(2)	(1) / (2)		
Small Schools (N=8)	21.1	12.6	1.73		
Medium Schools (N=9)	23.5	16.1	1.45		
Large Schools (N=7)	24.5	18.1	1.35		



FIGURE 1



**Model of System and School Influences on Staffing
and Curriculum Provision of a Secondary School**

FIGURE 2
Teacher and Student Time Allocated to
Curriculum Areas in ACT Secondary Colleges