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THE DETERMINANTS OF SCHOOL PARTICIPATION RATES: A CROSS-SECTIONAL ANALYSIS FOR NEW SOUTH WALES AND VICTORIA

Paul W. Miller

Discussion Paper No. 40

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THE DETERMINANTS OF SCHOOL PARTICIPATION RATES: A CROSS-SECTIONAL ANALYSIS FOR N.S.W. AND VICTORIA

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A B S T R A C T

Using data from the 1976 Australian Census of Population and Housing, estimates of the influence of family income, labour market conditions, religious denomination, foreign origin, locality and teenage income on the school participation rate of various teenage groups are obtained. These results suggest that family income is the most important determinant of school participation. The effect of the level of unemployment upon school participation is only modest. In some instances the direction of its influence is contrary to conventional wisdom.

THE DETERMINANTS OF SCHOOL PARTICIPATION RATES

-A CROSS-SECTIONAL ANALYSIS FOR N.S.W. AND VICTORIA.

Recent economic research has stressed the importance of the schools sector in explaining post 1972 trends in the teenage labour market. For example, Gregory & Stricker's (1981) analysis of post 1972 changes in teenage labour supply drew attention both to the fall in the male school participation rate which has occurred since 1972, and the absence of such a change in the female school participation rate. Though they venture the opinion that these changes may be related to variations in economic activity, they also state that the reasons for the changes are not well understood.

School participation may be modelled in either of two ways. First, one might attempt to explain changes in school participation rates over time largely in terms of macro-economic phenomena. Second, individual characteristics might be used to distinguish between school leavers and school stayers at a point in time.

Australian research has concentrated upon the latter of these approaches. [1] For example, Rosier (1978) enquired into the importance of environmental and personal factors which differentiate between 16 year old students and school leavers. The socio-economic level of the home (measured by a composite variable derived by combining father's occupation, father's education and mother's education) was found to have a strong influence on the school leaving decision. Other family environment factors found to be important include the level of literacy in the home and the extent to which parents displayed an interest in the school related activities of their children. School environment factors such as the type of school attended - whether government or non government, metropolitan or non-metropolitan - and the average socio-economic level of the student body

1. McGavin (1981) is one example of the former approach.

were also found to be important, as were personal factors such as the persons stated commitment to his future education, his academic achievement, and his perceived importance of education. The number of siblings in the family was found not to be an important determinant of the schooling decision.

The present study aims to establish the extent to which the influences of the personal characteristics found important using individual unit data carry over to a cross-section analysis using the Local Government Area (henceforth referred to as L.G.A.) as the unit of observation. This approach also permits examination of the influence of the economic circumstances prevailing in the economy. We examine the following sets of issues.

1. Do labour market conditions such as the unemployment rate in the particular locality play an important role in the school leaving decision?

2. What influence do socio-economic factors such as family income and the number of siblings in the family have - once we standardise for labour market factors?

3. Are there differences between the Australian and Overseas born, or between metropolitan and non-metropolitan areas?

The study has five sections.

Section I discusses the data and outlines a conceptual framework for examining the variations among L.G.A.s in teenage school participation rates. The second Section presents results for males and females. Separate equations are estimated for each age, and for various aggregate age categories. Family income is found to be the most important determinant of the between L.G.A. variation in school participation rates.

The family income variable may, however, act as a surrogate for a range of variables, including parents' schooling level and home environment effects. If this be the case, the estimated coefficients attached to this variable will give a misleading impression of the magnitude of the pure income effect. Thus in Section III we attempt to dis-entangle the effects of one of these variables - father's schooling level. In Section IV we use our cross-section results to project trends in school participation rates. The fifth Section summarises the study.

I. THE DATA AND CONCEPTUAL FRAMEWORK.

This study uses data from the 1976 Australian Census of Population and Housing and treats the L.G.A. as the unit of observation. Only L.G.A.s in New South Wales and Victoria having a total population greater than 10 000 are included. [2] A total of 158 L.G.A.s are involved- 79 in N.S.W. and an equal number in Victoria. Data for these L.G.A.s were extracted from 1976 Census Matrix tapes 13 and 36, and from the L.G.A.(1) Summary File. A detailed description of all variables, as well as means and standard deviations, and an outline of some of the deficiencies in the data are presented in Appendix A.

There is considerable variation among L.G.A.s in the percentage of teenagers enrolled at school. For example, within the Melbourne Metropolitan area, the teenage male school participation rate ranges from around 56 per cent in Brighton, Bulla, Camperwell and Doncaster to 33 per cent in St. Kilda, 30 Per cent in Mornington and 18 per cent in Hastings.

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2. 1976 Census tape 36 - our main data source - contains data for New South Wales and Victoria only. Within these states, the analysis was restricted to those L.G.A.s having a total population greater than 10 000 to improve the homoscedastic properties of the model. Following the procedure detailed in Miller and Volker (1981) we find that heteroscedasticity is not a major problem with our estimated equations.

The estimating equation we use to account for this variation is a single demand equation of the form:

$$E = E(Fam, R, X) \quad \langle 1 \rangle$$

where,

E is the school participation rate,

Fam represents family background factors,

R is the return to the incremental year of schooling,

X represents other characteristics of the L.G.A. which are thought to influence the average completed education level of the L.G.A..

Family Background: Fam

Theoretical and empirical examinations of the demand for schooling have stressed family background factors as a key determinant of the completed education level. Table 1 presents school participation rates cross classified by age and family income. [3]

TABLE 1

SCHOOL PARTICIPATION RATES CROSS CLASSIFIED BY FAMILY INCOME AND AGE

AGE	FAMILY INCOME					
	< 6	6-9	9-12	12-15	15-18	18+
1.MALES						
15	81.20	87.14	92.06	92.54	95.02	96.74
16	53.84	57.43	65.29	69.08	72.92	83.90
17	27.12	32.51	40.17	45.02	51.91	66.95
18	7.79	9.74	12.64	13.64	15.58	18.81
19	2.46	2.52	3.64	3.96	3.93	4.29
15-19	34.54	40.81	48.53	50.85	53.97	61.29
2.FEMALES						
15	82.25	86.16	90.21	91.88	94.15	96.67
16	54.50	56.88	63.95	67.51	72.64	83.43
17	28.40	32.45	38.98	43.41	50.52	67.17
18	5.50	7.31	8.13	10.14	10.76	14.31
19	1.17	1.39	1.82	2.32	1.57	2.38
15-19	33.96	39.53	46.32	48.21	52.83	61.65

3. See Appendix B for an alternative presentation of these data.

There is a clear positive relationship between family income and school participation rates. For example, 15 year old males with a family income of less than $6 000 have a school participation rate of 81.20 per cent - some 15.54 percentage points lower than the school participation rate of 15 year old males from families with an income of greater than $18 000.

There are a number of ways in which a family background factor such as family income, or the number of siblings in the family, the language spoken in the home, or the parents' education level could affect the teenager's school leaving age, namely by:

1. Improving the opportunity for the teenager to obtain more education [eg:Gregory & Duncan (1980), Palmer (1975)],

2. Increasing the intelligence (heredity factors), motivation and aspiration of teenagers shown to be positively related to school leaving age by Palmer and Rosier,

3. Increasing the family's desired educational attainment for their children [see for example, the family utility approach of Edwards (1975)],

4. Increasing the home investment in human capital which may either substitute for, or complement formal schooling. For example, Leibowitz (1974) demonstrates that there is a positive relationship between parents' education and the quality and quantity (mother only) of time spent with children, and further, that this leads to an increase in the educational attainment of the children. Such a relationship would be weakened as the number of children in the family increases.

Though such a study would be desirable, we cannot investigate separately each of these paths of influence. Rather our analysis simply looks at the combined effect upon school enrolments of the family background factors listed above.

Rates of Return to Education: R

The relationship between rates of return to education and school enrolments was discussed by Becker (1964,p.95). Becker's analysis, which postulates a positive relationship between rates of return and school participation rates, presents the rate of return as being a key determinant of school participation. In addition, the inclusion of a rate of return variable in the analysis offers the potential of distinguishing between the investment and consumption theories of education. However, our attempt to incorporate a rate of return variable in the estimated equations was not without major difficulty. For each L.G.A. we constructed a rate of return variable by relating the earnings in that L.G.A. after a given period of labour market experience to earnings foregone (in the same L.G.A.) during the terminal year of schooling. Our reservations about the appropriateness of this measure centre around the mobility of the workforce across L.G.A.s. If the opportunity costs of education were the same in each L.G.A., mobility in later years would tend to equalise across L.G.A.s the expected returns from education. Hence it is not surprising that when the rate of return variable was included in the estimated equations, the estimated coefficients were either insignificant, or had the wrong (negative) sign.

Hence it was decided to enter only opportunity cost variables in the estimated equation. As the school age population would not be as mobile across L.G.A.s as the older age groups - if they move at all it would be generally be because their parents had moved and not as a response to differentials in the opportunity cost of school attendance - opportunity cost may be held to contain information about both the immediate cost

outlays associated with education and the potential profitability of additional years of education. There are three main components of opportunity cost: foregone earnings, labour market conditions and the direct costs of education. We assume that the direct costs of education are negligible and may be ignored. Foregone earnings (in each L.G.A.) are measured by the average income at age t of individuals having a school leaving age of (t-1). The preferred measure of labour market conditions is the prime age male unemployment rate.

Other Factors Influencing Participation Rates: X

Other characteristics of the L.G.A. which may affect the schooling decision include the mobility of the L.G.A.s' population [4], the proportion of the population who were born Overseas, the religious denomination of the L.G.A.s' population, and the geographical location of the L.G.A..

II. RESULTS OF THE ANALYSIS.

Equation (1) was estimated using ordinary least squares. [5] Separate equations were estimated for 15, 16, 17 and 18 year olds, along with equations aggregated over these age groups. Table 2 presents results for males. The results for females are discussed later.

a. Males

Most interest centres upon the relationship between school participation rates and two variables - family income and the unemployment rate.

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4. By disrupting the schooling career, moving residence may hasten entry into the labour market.

5. Estimates obtained using a logit function and maximum likelihood methods were generally similar to the ordinary least squares results. We comment only on the OLS results.

TABLE 2

ESTIMATED COEFFICIENTS FOR MALES

AGE	15	16	17	18	15-19	15-18	16-18	17-18
Regressors								
State	-0.510	6.788	1.470	3.026	3.276	3.009	4.373	2.876
	(0.75)	(4.38)	(0.98)	(3.51)	(3.01)	(2.68)	(3.51)	(2.57)
Non-Met.	1.855	1.773	0.421	0.362	0.602	0.884	0.890	0.078
	(2.64)	(1.11)	(0.28)	(0.41)	(0.54)	(0.77)	(0.69)	(0.07)
Mobility	-0.091	-0.104	0.033	-0.030	-0.134	-0.110	-0.056	-0.005
	(3.08)	(1.52)	(0.47)	(0.79)	(2.63)	(2.09)	(0.96)	(0.10)
% Catholics	0.004	0.365	0.338	0.146	0.156	0.199	0.296	0.249
	(0.10)	(3.58)	(3.62)	(2.73)	(2.23)	(2.76)	(3.71)	(3.54)
Income Foregone	0.095	-0.194	-0.937	-0.137	-0.599	-0.665	-0.695	-0.675
	(2.46)	(0.91)	(4.45)	(1.88)	(3.31)	(3.40)	(3.25)	(4.10)
Family Income	0.187	0.524	0.644	0.196	0.328	0.383	0.471	0.432
	(8.41)	(10.22)	(13.26)	(6.96)	(8.86)	(10.23)	(11.31)	(11.82)
Unempl. Rate	-0.140	1.147	1.652	0.693	0.135	0.335	0.816	0.961
	(0.55)	(1.98)	(2.94)	(2.12)	(0.33)	(0.79)	(1.73)	(2.27)
R^2	0.505	0.536	0.642	0.363	0.503	0.542	0.567	0.590

TABLE 3

ELASTICITIES CALCULATED FROM MALE EQUATIONS

AGE	15	16	17	18	15-19	15-18	16-18	17-18
Regressors								
Family Income	0.264	1.025	2.044	2.076	0.941	0.913	1.496	2.058
Unempl. Rate	-0.005	0.053	0.126	0.186	0.009	0.019	0.062	0.110
Income Foregone	0.034	-	-0.886	-0.520	-0.554	-0.482	-0.672	-1.029
Unempl. Rate (19)	-	-	0.085	0.222	0.036	0.038	0.052	0.098

Family income is by far the most important determinant of school participation rates: between 46 and 65 per cent of the explanation in the estimated equations is attributable to this variable. In each age category there is a significant positive relationship between school participation and family income after standardisation for area unemployment rate, income foregone, locality, mobility and religious factors. The present 'rich' are either better able to financially support their children's education, or (and) provide a home environment which fosters the development of motivation and the desire to achieve which others (eg:Rosier) have found to be related to the decision to stay on at school.

The elasticities of the school participation rates with respect to family income (evaluated at the mean) are presented in Table 3 (row 1). These elasticities are very high. For example, for the 17 year olds' equation, they indicate that a one per cent increase in family income would result in a two per cent increase in the school participation rate. The possibility that the family income variable acts as a surrogate for other variables such as parents' schooling level, home environment, and quality of life in general, as well as pure income effects suggests that care be exercised in the interpretation of this result. [6] Section III is devoted to a discussion of disentangling the separate effects of father's schooling level.

Turning to the prime age male unemployment rate variable, and examining first the equation for 15 year olds, we find an absence of a statistically significant relationship between the percentage of 15 year olds attending school and the prime age male unemployment rate. This contrasts with the general belief that (many!) students will stay on at school in order to avoid being unemployed. However, this result may be the net effect of two offsetting tendencies:

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6. An alternative explanation may be the so called 'ecological problem' - see Firebaugh (1978).

1. A higher unemployment rate for teenagers, reflecting reduced job opportunities, induces a higher school participation rate,

2. A higher unemployment rate for adults in the same area reduces the ability of a family to support a child in school, thereby lowering the school participation rate.

The inclusion of a teenage unemployment rate variable in the estimated equation did not alter this finding. The unemployment rate of the 19 year old 'not-enrolled' category was chosen to avoid the simultaneity problems inherent in using unemployment rates relating to the age group being examined. Although there is a positive relationship between the prime age male and the 19 year old 'not-enrolled' male unemployment rates, the correlation is not exceedingly high ($r = 0.595$). [7] Inclusion of both regressors in the estimated equation generally resulted in the prime age male unemployment rate being significant and the teenage labour market variable being insignificant.

In the case of 16, 17 and 18 year olds, an increase in the prime age male unemployment rate leads to a statistically significant increase in school enrolments. In the light of our discussion of 15 year olds, this implies that the 'job opportunities' effect dominates the 'family financing' effect. From the regression coefficients presented in Table 2 we see that a one percentage point increase in the male unemployment rate would increase the average school participation rate in the L.G.A. by in excess of one percentage point in the case of 16 and 17 year olds, and by nearly 0.7 of one percentage point in the case of 18 year olds. However, comparing the relative effects of unemployment and family income as indicated by the elasticities presented in Table 3, we see that the

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7. The regression equation is:
$U(35) = 0.816 + 0.226\ U(19)$

$R^2 = 0.354$

elasticity of school participation rates with respect to unemployment is substantially less than that with respect to family income.

Religious denomination is an important influence upon school participation rates. The per cent of the L.G.A.s' population who are Catholic enters the estimated equations for 16, 17 and 18 year olds as a significant positive variable. The effects which this variable may be capturing are not immediately obvious. It could be claimed that either Catholic schools increase the likelihood of their students continuing on at school for an additional year, or there is some characteristic of Catholic families over and above that explained by the other variables included in our estimated equation, which acts to increase the likelihood of the child staying on at school, i.e. the 'per cent Catholic' variable may be describing a link between religion (family background) and the levels of parental encouragement, achievement and aspiration of children found important by Rosier.

The non-metropolitan dummy is significant only in the equation for 15 year olds. For this age group, this dummy indicates either:

1. differences in the schools systems between metropolitan and non-metropolitan areas, or

2. differences in geographical location and the concomittant labour market differences, levels of isolation, cultural environment etc.

which result in non-metropolitan dwelling 15 year old males having a higher propensity to attend school.

The State dummy is significant in the equations for 16 and 18 year olds. The reasons why this dummy might be significant parallel those for the rural dummy. There may be differences between the schools systems in New South Wales and Victoria which make participation in one State's school

system more attractive than the other or there may be labour market differences between the two States.

In the case of 16 year olds, the coefficient attached to the State dummy is quite large - 6.788. [8] That is, all other things being equal, the school participation rate of 16 year olds in Victoria is 6.788 percentage points higher than in New South Wales.

Income foregone [defined as the average income at age t of individuals having a school leaving age of (t-1)] enters the equations estimated for the older age groups with the expected negative sign. Increases in current teenage income encourages teenagers to leave school. It is of interest to compare the 'income foregone' elasticity with the family income and unemployment rate elasticities. The income foregone elasticities are presented in row 3 of Table 3. Whilst the elasticities associated with foregone earnings are greater than those associated with the unemployment rate, they are considerably less than those associated with family income. In other words, a one per cent change in family income has a far greater impact upon the school participation rate than a similar change in foregone earnings. In turn, a one per cent change in foregone earnings has a greater impact upon the school participation rate than a one per cent change in the unemployment rate.

In the equation for 15 year olds, the income foregone variable enters with a significant positive sign, whereas the expected sign was negative. This result may be associated with a data problem: the income foregone variable was missing for a number of L.G.A.s. The results reported in

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8. The age-grade patterns in the New South Wales and Victorian school systems are similar. One important difference between the systems though is that in New South Wales a certificate is awarded upon successful completion of year 10, whereas in Victoria, schools issue a certificate at the end of year 11. This difference presumably accounts for the size of the estimated coefficients attached to the State dummy for 16 year olds. It is noted that the A.B.S. publication SCHOOLS Australia 1976 indicates the gross participation rate of 16 year old males to be 62.04 per cent in N.S.W. and 66.42 per cent in Victoria: a 4.38 percentage point difference in favour of Victoria.

Table 2 attempt to overcome this problem using the 'zero order regression method'. This involves substituting for the missing values the sample mean of the available observations. Further experimentation directed at this data problem did not imporve the results. [9] It is noted, however, that the coefficients associated with all variables other than the income foregone variable were reasonably insensitive to this experimentation.

Finally, the mobility variable is significant in only one equation - that of 15 year olds. In other words, the dislocation caused by moving home appears only to affect the schooling decisions of 15 year olds. Once a commitment to secondary schooling has been made, it is not readily reversed.

Before we turn to examine the female equations, it will be instructive to discuss some of the variables found not to be significantly related to school participation rates.

The effect of the number of children in the family upon school participation rates was found not to be significantly different from zero. This result is surprising since a large family would place additional expenditure demands upon any given level of family income. Our result is consistent with Rosier's Australian research on the schooling decisions of Australian youth, but contrasts with Leibowitz's finding of a negative relationship between the number of siblings and educational attainment for the U.S.. [10]

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9. As one alternative, we dropped from the analysis all observations for which the income foregone variable was missing. This did not substantially alter our findings. Attempts were also made to estimate a foregone earnings equation using the available observations and use this equation to predict a wage for the missing value cases. However our estimated equation had an unacceptably low explanatory power; this probably being attributable to the high variability (unreliability?) of the reported income for 15 year olds who had left school aged 14 years. This prompts the suggestion that the equation for 15 year olds be treated with caution.

10. The data source used by Leibowitz was quite unique - all scored in the top 1 per cent of the national I.Q. distribution. Because of this the Leibowitz findings cannot be readily generalised to the U.S. population as a whole, nor to other countries.

When the average schooling level of the 'parents' of teenagers was added to the regressors listed in Table 2, it was found to be insignificant. Certainly Leibowitz's findings, along with those of Broom et.al. (1980) led us to expect a statistically significant positive relationship between school participation rates and this family background factor. Perhaps the insignificance of parents' schooling may be attributable to our use of group averages - although the Edwards study which uses averages for 48 States of the U.S. and reports father's education to be an important determinant of school enrolments would deny this.

Finally, although Overseas born teenage males have an aggregate school participation rate around three percentage points higher than the Australian born, the percentage of the L.G.A.s' population who were Overseas born does not significantly affect the school participation rate. In other words, once we include variables such as family income, the area unemployment rate, and income foregone in our estimating equation, none of the remaining L.G.A. variations in school participation rates could be explained by the addition of the Overseas born variable.

In summary, it can be said that the equations estimated for males are quite acceptable. The degree of explanation ranges from 0.363 to 0.642 per cent, and the majority of the coefficients are of the expected sign. However, the estimation of similar equations for females produced several anomalous results.

b. Females

Table 4 presents the female results.

Family income is the most important determinant of female school participation rates, with between 17 and 54 per cent of the explained between L.G.A. variation in female school participation rates due to this

TABLE 4

ESTIMATED COEFFICIENTS FOR FEMALES

AGE	15	16	17	18	15-19	15-18	16-18	17-18
Regressors								
State	-1.301	10.545	3.232	0.659	4.430	4.173	5.657	2.641
	(1.54)	(7.24)	(2.37)	(1.26)	(4.65)	(4.10)	(5.33)	(2.94)
Non-Met.	1.470	4.420	1.541	-0.781	0.832	1.089	1.430	0.382
	(1.72)	(2.90)	(1.13)	(1.47)	(0.89)	(1.11)	(1.40)	(0.44)
Mobility	-0.052	-0.039	-0.113	-0.041	-0.316	-0.269	-0.218	-0.176
	(1.45)	(0.64)	(1.95)	(1.84)	(7.91)	(6.44)	(5.02)	(4.75)
% Catholics	-0.077	0.133	-0.047	-0.045	-0.176	-0.165	-0.080	-0.080
	(1.45)	(1.44)	(0.53)	(1.36)	(2.91)	(2.59)	(1.21)	(1.44)
Income Foregone	0.083	0.133	0.290	0.029	-0.235	-0.047	0.106	0.164
	(1.55)	(0.70)	(1.32)	(0.44)	(1.38)	(0.25)	(0.54)	(1.06)
Family Income	0.132	0.453	0.465	0.035	0.200	0.241	0.300	0.258
	(4.75)	(9.40)	(10.28)	(2.02)	(5.91)	(7.01)	(8.40)	(8.88)
Unempl. Rate	-0.110	1.525	1.106	0.048	0.361	0.414	0.648	0.603
	(0.33)	(2.68)	(2.08)	(0.24)	(0.99)	(1.09)	(1.63)	(1.80)
R^2	0.300	0.533	0.566	0.139	0.563	0.552	0.579	0.558

TABLE 5

ELASTICITIES CALCULATED FROM FEMALE EQUATIONS

AGE	15	16	17	18	15-19	15-18	16-18	17-18
Regressors								
Family Income	0.188	0.895	1.567	0.568	0.615	0.607	1.037	1.419
Unempl. Rate	-	0.072	0.089	-	-	-	0.050	0.080
Unempl. Rate (19)	-	-	-	0.106	-	-	-	-

variable.

The higher the average family income of the L.G.A., the higher the female school participation rate. This result is true of all ages examined. The elasticities of female school participation rates with respect to this variable are presented in Table 5. They range from 0.188 (15 year olds) to 1.567 (17 year olds). These elasticities are considerably smaller than the comparable elasticities for males. But their absolute magnitude prompts the same suggestion as did the absolute size of the male elasticities: the family income variable may be capturing effects other than a simple income effect.

The area unemployment rate (as measured by the unemployment rate of prime age males) is significant in only two equations - 16 and 17 year olds. A one percentage point change in the unemployment rate raises the school participation rate of 16 year olds by 1.525 percentage points, and the participation rate of 17 year olds by 1.106 percentage points. Comparing the unemployment rate elasticities in Table 5 with the family income elasticities, we find the school participation rates to be more responsive to a one percent change in family income than to a comparable change in unemployment rates.

The State dummy is highly significant in the equations for 16 and 17 year olds. Furthermore, the size of this differential is surprisingly large - 10.545 percentage points for 16 year olds and 3.232 percentage points for 17 year olds. This again illustrates the large differences between the States in the proportion of teenagers attending school. [11]

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11. This standardised differential is similar in magnitude to the gross differential in school participation rates between the States - from the A.B.S. publication Schools Australia 1976, the school participation of 16 year olds is 58.2 per cent in N.S.W. and 69.9 per cent in Victoria, and for 17 year olds the percentages attending school are 35 per cent in N.S.W. and 38.1 per cent in Victoria.

The non-metropolitan dummy is significant in the equations for the two younger ages - 15 and 16 year olds. This contrasts with the male results where there was a significant difference between metropolitan and non-metropolitan areas only in the equation for 15 year olds. In the case of 15 year olds, the size of this dummy for males and females is similar: 1.86 for males and 1.47 for females. Whilst these differences between metropolitan and non-metropolitan areas are reasonably minor, that for 16 year old females is quite large, 4.420 %. It is felt that this excess in school participation rates in non-metropolitan areas reflects regional labour market differences rather than some underlying difference in the school systems which renders attendance at a non-metropolitan school more attractive than attendance at a metropolitan school.

There is a striking difference between the male and female equations in the performance of the mobility, % Catholics and income foregone variables.

It will be recalled that for males, the mobility variable was significant in the estimated equation for 15 year olds. Yet for females, it is significant (at the 10% level) for 17 and 18 year olds, and insignificant for 15 year olds. According to these results, which are rather difficult to rationalise, mobility matters for older but not younger females.

Turning to the % catholics variable, we find it to be insignificant in the equations for individual ages, and significant and <u>negative</u> in the aggregate equations for 15-19 and 15-18 year olds. This contrasts with the male equations where the higher the proportion of catholics in the L.G.A. the higher the participation rate of 16, 17 and 18 year olds. The question of why education goals for Catholic males and females differ is deserving of attention in future research.

Finally, foregone earnings, a variable which was significant in the male equations, is insignificant in all female equations. Perhaps the reason for this is as pointed out by Edwards: our estimated equations may be mis-specified because the opportunity cost of schooling for females is possibly more accurately measured by their (unmeasurable) shadow price in home production than by a measure of labour market opportunities.

III. THE INFLUENCE OF FAMILY INCOME

As discussed above, we suspect the family income variable is acting as a surrogate for a range of effects: education financing, the influence of parents' schooling level etc.. In this section we investigate the inter-relationship between family income and one of these factors, father's schooling level. At the same time we investigate the question of simultaneity between schooling decisions and family income.

The starting point of our analysis is the following two equation system: [12]

$$E = E(FY, Mob, YF, STE, NM, Cath, U) \qquad (1)$$

$$FY = FY(E, STE, NM, U, ASLA) \qquad (2)$$

Equation 1 is identical to that estimated using OLS in Section 3. It relates school participation rates (E) to family income (FY), the mobility of the population (Mob), income foregone (YF), State (STE), region (NM), religion (Cath) and the prime age male unemployment rate (U). The family income equation (equation 2) relates the average family income in the L.G.A. to the average school leaving age of married males aged 35-54 (ASLA), the area unemployment rate, locality and the school participation rate. In other words, we are suggesting that to facilitate the education of their children, a family will attempt to increase their income.

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12. Since equation 1 is exactly identified, 2SLS and indirect least squares estimates of the parameters are identical. Furthermore, given that equation 1 is exactly identified and equation 2 overidentified, the 2SLS and 3SLS estimators of the second equation are identical, though they will not be for the first equation.

Table 6 presents results for males and females for 2 ages: 16 and 17 year olds. [13]

In the family income equation we focus upon 3 variables: % enrolled, father's schooling level and the area unemployment rate. The % enrolled variable is significant in all equations, although only at the 10% level in the equation for 17 year old females. This lends support to the above suggestion that families augment family income in order to support their children at school.

Father's schooling level has a strong influence upon family income. An increase of one year in the average school leaving age of the L.G.A. (mean 15.11, standard deviation 0.423) raises family income by between $2 100 and $2 800. And the lower the area unemployment rate, the higher is the average family income.

Our main interest in the father's schooling level and the unemployment rate variables, however, rests with their indirect influence upon school enrolments via the family income equation. Increases in the average schooling level of married males aged 35-54 years, and decreases in the area unemployment rate both increase family income and thus raise the school participation rate. The implied elasticity of school participation with respect to father's schooling level is very high, ranging from 2.4 to 6.8 per cent. Thus, father's schooling level appears to be an extremely important variable.

The total response of school enrolments to a change in the area unemployment rate is also important. This is negative in three of the four equations...the participation rate reducing effect via the family income equation outweighs the positive impact via the participation rate equation.

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13. The two equation system was estimated for all age groups. But due to the low explanatory power of the OLS participation rate equation for 18 year olds, and due to the reservations already expressed over the OLS equation for 15 year olds, we restrict our attention in this Section to 16 and 17 year olds.

TABLE 6

TWO STAGE LEAST SQUARES ESTIMATES

	MALES				FEMALES			
AGE	16		17		16		17	
Equation	E	FY	E	FY	E	FY	E	FY
Regressors								
State	6.647	-2.952	1.363	-0.455	10.751	-9.027	3.400	-1.787
	(4.36)	(2.19)	(0.92)	(0.45)	(7.43)	(2.48)	(2.51)	(1.25)
Non Met.	1.589	-6.060	0.277	-5.874	4.629	-7.820	1.726	-6.583
	(1.00)	(5.50)	(0.18)	(5.38)	(3.06)	(5.89)	(1.26)	(5.64)
Mobility	-0.102		0.035		-0.046		-0.118	
	(1.52)		(0.52)		(0.76)		(2.07)	
%	0.351		0.330		0.148		-0.035	
Catholics	(3.46)		(3.57)		(1.60)		(0.40)	
Income	-0.048		-0.253		0.034		0.075	
Foregone	(0.86)		(4.55)		(0.67)		(1.30)	
Family	0.507		0.632		0.472		0.481	
Income	(8.89)		(11.74)		(8.76)		(9.48)	
Unempl.	1.040	-2.782	1.574	-3.234	1.671	-3.238	1.223	-2.919
Rate	(1.76)	(7.16)	(2.74)	(10.12)	(2.83)	(7.42)	(2.22)	(6.41)
ASLA		26.640		28.160		21.034		24.175
		(11.66)		(13.02)		(4.26)		(4.78)
%		0.532		0.300		0.879		0.588
Enrolled		(3.48)		(2.79)		(2.62)		(1.86)
R^2	0.536	0.897	0.642	0.913	0.532	0.834	0.566	0.886

Note:
* As the R^2 is not well defined in 2SLS models, its use is questionable.

TABLE 7

ELASTICITIES CALCULATED FROM TWO STAGE LEAST SQUARES ESTIMATES

	MALES		FEMALES	
AGE	16	17	16	17
Regressors				
Unempl. Rate	-0.017	-0.036	0.007	-0.015
ASLA	3.187	6.815	2.369	4.730

This contrasts with the OLS results of Section II. There we found, holding family income level constant, that the effect of an increase in unemployment was to encourage would-be school leavers to postpone their entry into the labour market and remain at school. However, after allowing the unemployment rate increase to influence the level of family income, we find an apparent reduced capability on behalf of the family to support teenagers at school. The net effect, as described above, is for an increase in the area unemployment rate to lead to a reduction in the area school participation rate. This result is contrary to conventional wisdom.

The elasticities calculated from the 2SLS model are presented in Table 7. It is of interest to note that in each case the participation rate reducing effect of unemployment is greater for males than for females.

Finally, we note that the OLS estimates are all well within 1 standard error of the 2SLS estimates, indicating that the simultaneity issue is not paramount.

IV. A PROJECTION OF TRENDS IN SCHOOL PARTICIPATION

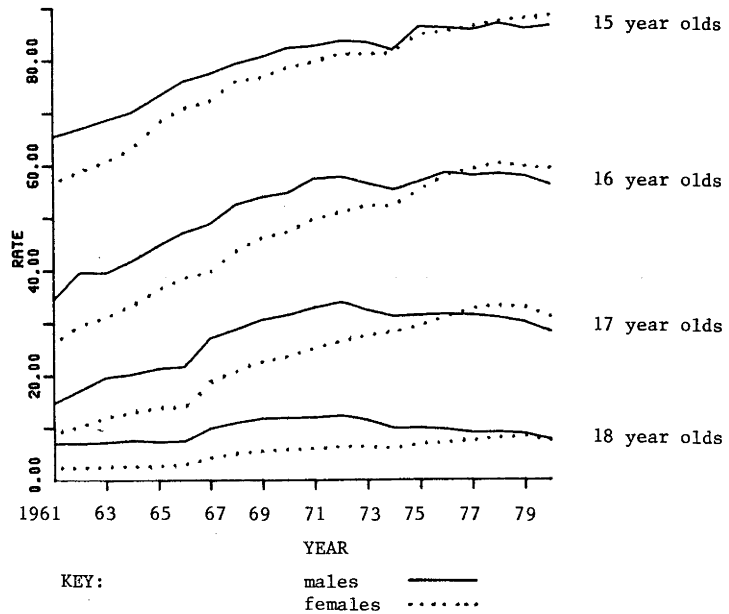
Figure 1 displays the school participation rates of various teenage groups from 1962 to 1980.

Can the cross-section estimates be used to project trends in school participation rates?

In our examination of this issue, we restrict our attention to three variables; family income, the unemployment rate and foregone earnings. All other variables are assumed invariant with time. Family income data for New South Wales and Victoria are available from the Income Distribution Surveys of 1968/69, 1973/74 and 1978/79. These are converted into common dollar equivalents by deflating by the consumer price index. Unemployment rates are readily available from the labour force survey, whilst a measure

FIGURE 1

SCHOOL PARTICIPATION RATES



of foregone earnings for individual ages may be obtained by adjusting the 1976 Census figures for movements in average weekly earnings, and converting to real terms through deflating by the consumer price index.

Table 8 compares actual changes in school participation rates over two periods - 1968-73 and 1973-78 - with the changes predicted using the OLS estimates of Tables 3 and 5 in conjunction with the movements in the data series discussed above.

TABLE 8

ACTUAL AND PREDICTED CHANGES IN SCHOOL PARTICIPATION RATES

	1968-1973			1973-1978		
	Actual	Predicted	Error	Actual	Predicted	Error
1.Males						
16 years	3.82	8.28	4.46	1.81	2.65	0.84
17 years	3.39	4.61	1.22	-1.35	2.93	4.28
18 years	0.33	2.36	2.02	-2.29	1.52	3.81
2.Females						
16 years	8.49	9.21	0.72	8.18	3.95	-4.23
17 years	6.76	10.91	4.15	5.66	3.16	-2.50
18 years	1.38	0.89	-0.49	1.65	0.16	-1.49

Our cross-sectional projections predict that school participation rates would increase in each period and for each group. They predict a much smaller increase in participation rates over 1973-78 than over the 1968-73 period.

Comparing the predicted changes with actual movements in male school participation rates, we find the predicted changes over-estimate the actual changes in all comparisons. More importantly, whilst our cross-sectional projections predict a slowdown in the growth in male school participation rates over 1973-78, they do not predict the fall in the level of school participation which occurred over this period for 17 and 18 year olds.

For females, our cross-sectional projections over-predict the increase in school participation rates between 1968 and 1973, but the prediction error is considerably less than for males. Over the second five year period our predicted values are all less than the actual changes - our cross section estimates predict a downturn in the growth in female school participation similar to that predicted for males, whereas female school participation rates continued to rise at rates of growth comparable to those experienced over the 1968-1973 period.

Thus, it must be conceded that our cross-sectional projections fail to track closely the actual changes in school participation rates over time. But as Parsons (1980) points out: "The ability to 'explain' time-series trends is, of course, a difficult test for any cross-sectional model." There are two obvious reasons why our cross-section estimates might fail to yield predictions close to actual participation rates. First, our inability to separate from the family income variable factors such as motivation, IQ, and levels of parental encouragement. These factors, for which family income undoubtedly acts as a surrogate in the cross-section analysis, may not necessarily increase over time as family income has done.

Second, community attitudes - which our cross-section attempts to hold constant - may vary over time. Any such attitudinal changes will not be captured by our predicted values. For example, if there has been a greater community acceptance of a wider role for females in the market economy and this leads to an increase in their school participation, our cross-sectional projections should consistently under-predict the actual changes. As the scenario used in this example is viewed in most quarters as a reasonable depiction of the 1973-78 period, it is somewhat reassuring that our cross-section predictions for females for this period fall short of the actual school participation rates.

V. CONCLUSION

Who gets to go to school?

The analysis in this paper suggests that the children of rich families participate in the schools sector to a (far) greater degree than the children of poor families. Family income was found to be the most important determinant of school participation rates.

But do labour market conditions matter?

In our single equation model (Section II), labour market

conditions - as proxied by the prime age male unemployment rate - were significantly and positively related to school participation rates in most equations. But in the simultaneous model examined in Section III, the unemployment rate was found, in three cases out of the four examined, to have a negative effect overall.

And what of the other variables examined such as father's schooling level, income foregone, birthplace and mobility?

Father's schooling level exerts a rather important indirect influence (through the family income equation) upon school participation rates. Moving residence from one L.G.A. to another was found to disrupt the schooling of 15 year old males, but not older males. In the case of females it was the older females for whom mobility seemed to disrupt schooling.

The percentage of the teenagers in the L.G.A. who were of foreign origin has no significant influence upon the school participation rate.

Finally and briefly, what are the implications of the study? First, the effects established for many of the variable used in the analysis of individual level data carry over into our study of group averages. Second, despite the provision of 'free' education, it is the children of the rich who receive relatively more education. Third, our cross-sectional projections of school participation changes over the period 1973-78 overpredict male school participation rate changes and underpredict the increases in female school participation rates. This suggests that changing social attitudes towards females' "market role" may be an important part of the explanation of why female school participation rates have risen relative to male school participation rates in the post 1972 period.

APPENDIX A.

All variables are constructed using the L.G.A. as the unit of observation.

1. School Participation rate age t: This is defined as the proportion of the age group who were attending school. Notice that it excludes teenagers attending tertiary institutions.

2. Unemployment rate-PAM: This is the unemployment rate of all males aged 35-54.

3. Unemployment rate-19: The unemployment rate of the not-enrolled category of 19 year old males or females.

4. Mobility: Defined as the percentage of all 15-19 year old males or females residing in the L.G.A. at the time of the Census who moved into that L.G.A. in the previous 5 years.

5. % Catholics: The percentage of all persons (answering the Census religion question) in the L.G.A. who stated that they were Catholics.

6. Family Income: The following definitions were experimented with: the average family income of 35-54 year old married males; the average personal income of 35-54 year old married males; the average personal income of 35-54 year old married females. All equations presented in this paper use the first definition.

7. Income foregone-t: Defined as the average personal income of individuals aged t who had a school leaving age of (t-1). For the analysis of the aggregated data, this opportunity cost variable was measured as the average of the income foregone of the individual ages comprising the age groups studied.

Another candidate for inclusion in our estimating equation is part time employment (defined for our purpose as employment involving less than 15 hours work). It is generally thought that a higher percentage of part time employment - the Gregory and Duncan education subsidy - would tend to increase the participation rate. But given the small amount of monetary compensation received by the overlap population, the response should be slight. Hence, our initial estimates which included a part time employment variable appeared unacceptable: they indicated that a one percentage point increase in the part time employment rate would increase the school participation rate of (say) 17 year old males and females by nearly 4 percentage points. Associated with the introduction of the part time variable into the estimated equations were substantial reductions in the coefficients attached to all the 'social indicator' type variables. Part of the reason for this exaggerated response may be the measurement of the variable we are using. Comparison of the number of persons working less than 15 hours from the Census and the Labour Force Survey reveals some particularly worrisome discrepancies. 231 464 persons were so employed according to the Census compared with 382 000 in the Labour Force Survey - a 65 % discrepancy. Given our ignorance as to how this descrepancy varies among socio-economic groups, it seems best, at this stage, to omit the part time variable from the analysis.

MEANS AND STANDARD DEVIATIONS OF REGRESSION VARIABLES

VARIABLE	MEAN	STANDARD DEVIATION
Males Enrolled		
Age 15	88.74	5.06
" 16	64.03	11.75
" 17	39.46	12.95
" 18	11.82	5.55
Females Enrolled		
Age 15	88.19	5.17
" 16	63.33	10.93
" 17	37.15	10.62
" 18	7.66	2.88
Unemployment		
-Prime Age Males	3.00	1.68
-Males aged 19	9.66	4.42
-Females aged 19	10.78	5.31
% Catholics	30.88	7.40
Schooling 35-54 males	15.11	0.42
Schooling 35-54 females	14.95	0.40
Family Income	125.22	18.98
Male Income Forgone		
Age 15	31.49	7.64
" 16	32.87	3.75
" 17	37.38	3.30
" 18	44.92	5.26
Female Income Forgone		
Age 15	31.52	6.79
" 16	30.81	3.56
" 17	39.97	2.75
" 18	42.98	3.53
Mobility		
-Males	26.97	11.02
-Females	31.08	11.66

Note: All income variables scaled by a factor of 0.01.

APPENDIX B

The table population for Table 1 is the total teenage population. Thus it includes teenagers who live by themselves as well as teenagers who live with their parents. 1976 Census Matrix Tape 36 does not distinguish between these two categories. However, we may refine the information presented in Table 2 by making the following data restrictions (the rationale for this data trimming should become obvious shortly).

(a) We eliminate married teenagers,

(b) We eliminate all persons who did not state an individual (personal) income,

(c) We eliminate all persons who are not associated with a stated family income code. It is emphasised that the family income concept relates only to persons enumerated in private dwellings on Census night. It is calculated from the sum of the mid-point of the range of the individual income of the head and spouse of the family, or head only as appropriate.

Three cases may be distinguished:-

(i) Family income exceeds individual income
(ii) Individual income exceeds family income
(iii) Family income equals individual income

Clearly in the first two cases the single teenager MUST be living with his family. But in the third case, the teenage could EITHER be living by himself, or with his family.

It is this third case which presents some difficulty. Our aim is to relate the school participation rate of teenagers still living at home to the income of their family. Hence, restricting the analysis to cases (i) and (ii) will exclude some persons who should be included. Conversely, examination of all three cases will include some persons who should have been excluded.

Rather than claim agnosticism through data deficiencies, we assume that IF an individual's personal income equals his family income [case (iii)] then he lives by his self. These individuals are excluded from the present analysis.

Table 9 presents, for the subset of teenagers who by the above criteria live with their parents, school participation rates cross-classified by family income.

TABLE 9

SCHOOL PARTICIPATION RATES CROSS CLASSIFIED
BY FAMILY INCOME AND AGE.

AGE	FAMILY INCOME					
	< 6	6-9	9-12	12-15	15-18	18+
1.MALES						
15	83.83	88.29	92.52	92.96	95.34	96.95
16	57.68	58.52	66.16	69.79	73.51	84.11
17	30.52	33.46	40.88	45.74	52.43	67.41
18	9.67	10.64	12.94	13.79	15.79	18.98
19	2.96	3.12	3.94	4.20	3.96	4.32
15-19	41.08	43.81	49.78	51.78	54.62	61.63
2.FEMALES						
15	84.84	86.97	91.07	92.50	94.73	95.92
16	59.31	58.50	65.19	68.42	73.44	83.81
17	35.65	34.98	41.04	44.83	51.24	67.65
18	8.73	9.15	9.54	11.60	11.44	14.53
19	2.07	2.23	2.60	3.60	2.04	2.48
15-19	45.83	45.46	50.97	53.22	55.85	62.47

The main point to note is a slight weakening of the positive relationship between family income and school participation.

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