

A QUANTITATIVE ANALYSIS OF THE DEMAND FOR HIGHER EDUCATION

GEORGE PSACHAROPOULOS

London School of Economics, London, U.K.

COSTAS SOUMELIS

O.E.C.D., Paris, France

ABSTRACT

This article analyses the plans of a sample of 7425 secondary school children in Greece regarding their demand for further education. A set of family, personal, geographical and school characteristics are related by means of multivariate analysis to the pupil's decision to continue or not his/her studies and to the particular institution of higher education he/she aspired entry. The maximum likelihood estimates of the "yes–no" pupil decision indicate the dominance of school grade as a key variable affecting plans for further study. An educational production function revealed in turn that it is mainly parents' education that relates to scholastic achievement. The article also contains empirical estimates of the relative strength of several family and school factors affecting self-selection which may make the results useful to policy makers who attempt to influence the social demand for post-secondary education.

This paper is an attempt to assess quantitatively the factors underlying the formation of the individual demand for education. The empirical analysis uses data from Greece, a European country where the *numerus clausus* has been in operation for many years. We believe, however, that the results reported here are of wider interest for the reasons explained in the first section below. The second section presents the sample used and some of the key variables that were constructed for the purposes of this analysis. Section III gives the main characteristics of those differing in their propensity to continue to higher education. Section IV presents the results of a multivariate analysis in an attempt to assess the statistical significance of certain factors affecting the decision to continue while controlling for others. The last section draws some conclusions from the empirical analysis.

I. The Rationale

The study of socio-economic influences on the pupil's decision to seek a place in post-secondary institutions leads to a better understanding of the formation of social demand for education at the tertiary level. Knowledge of the factors affecting social demand can in turn be used in a variety of circumstances according to the policy maker's needs. For example, in a country where the *numerus clausus* is in operation, one may wish to institute measures to dampen the strength of social demand before the latter has been openly expressed and thus save a part of the population personal frustration or, perhaps, avoid adverse political implications.

Even when no constraint exists on the educational system's capacity to satisfy the social demand for education, policy makers may wish to introduce a *numerus clausus* in order to avoid excessive rates of unemployment among university graduates, for instance. Knowledge of the factors affecting demand will help planners to adopt the most effective policy measures in restraining it. It might, however, be the case that some factors influencing the decision to continue to tertiary education are very resistant to policy manipulation. Even so, the results of a study such as the one undertaken here are useful in that they indicate to the planner how he has to change *other parts* of the system in order to *adapt* to, say, the increased social demand for higher education, e.g., by expanding the capacity of university places, and/or introducing stronger incentives to affect pupils' decisions.

II. The Sample and the Variables

The analysis in this paper is based on a national random stratified sample of 7425 Greek pupils who were in the last two years of secondary school in the Spring of 1974. (The strata refer to geographic location and type of school, e.g., boys--girls, public--private.) The sample size roughly corresponded to 7 percent of the eligible population [1].

The questionnaire (see O.E.C.D., 1976) produced information on a host of characteristics relating to the pupils' plans for further education and his (or her) family background, scholastic achievement and psychological (perception) factors. What follows is a brief account of the main variables used in this analysis.

THE DEPENDENT VARIABLE: STUDY PLANS

Figure 1 shows the distribution of student plans in the sample. Only 15 percent of the students stated that they intend to stop their education at the secondary level. The great majority would like to continue their studies

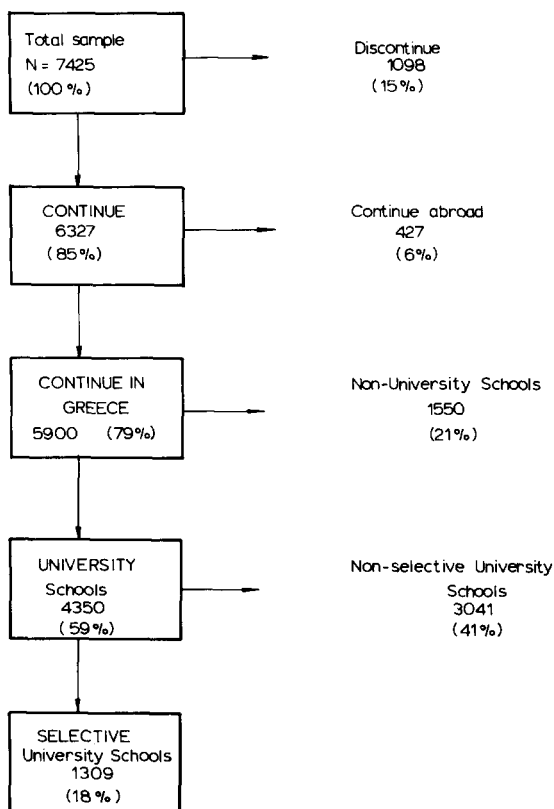


Fig. 1. The distribution of student plans in the sample. (All percentages refer to the total sample size.)

into some form of post-secondary education. Excluding those who would like to go abroad immediately (6 percent of the total sample), 21 percent would seek entry to non-university schools (such as teacher training or technical colleges) and 59 percent would attempt to enter university schools. Finally, 18 percent of the total sample would like to enter what we named “selective” university schools, usually medicine and engineering.

Thus, the secondary school graduate is faced with the following three decisions that we denote by a series of dummy variables with a value of 1 if the particular event applies and a value of 0 if not. First, a *vertical* decision depending on whether he plans to pursue his studies at the tertiary level (denoted by variable CONTINUE). Second, the student faces the *horizontal* decision on whether to seek a place at a university or non-university institution. We denote the former plan by a variable named UNIVERSITY. Finally, the student who plans to enter a university school faces a second-order horizontal decision, namely to seek entry to one of prestigious faculties (such as medicine and engineering) or one of the others (such as economics

or political studies). The former plan is denoted by a dummy variable called SELECTIVE university.

EXPLANATORY VARIABLES

An extensive literature exists on the determination of educational aspirations spanning several disciplines such as sociology, education, psychology and economics. As a result, several schemes have been used to classify the variables affecting the decision to continue, for example, exogenous vs. endogenous, institutional vs. individual, family vs. school, economic vs. non-economic, and other factors (see Härnqvist, 1978). We are here particularly concerned with policy vs. non-policy variables, i.e. factors that could be influenced by the policy maker (e.g. student grants to compensate for low family income) and those factors that are beyond his immediate control (like sex-role stereotypes) [2].

For the sake of discussion, however, we have grouped our independent variables into the following major categories: geographic location of the secondary school, family background, the student's scholastic achievement, economic factors and perceptions and attitudes. Of course sex is a surrogate factor that relates to the CONTINUE decision and its variants via the transmission of sex-role stereotypes. We thus constructed a

SEX (0–1) variable, the value of 1 corresponding to males.

We expect this variable to be positively related to the CONTINUE, UNIVERSITY and SELECTIVE decisions.

Geographic Location

In Greece, a country with socio-economic disparity between regions, we expect the location variable to act as a surrogate for many other characteristics which we try to measure individually. For example, the fact that the student lives in a city means that his family may have an above average income, his parents may have a higher than average educational level and thus foster a CONTINUE aspiration on the child. Furthermore, the location variable may catch the "peer group effect" (i.e. the environmental push or quality-of-fellow students) something that we cannot measure independently in this sample. Thus we constructed an

URBAN 0–1 dummy variable to denote the fact (equal 1) that the particular student attends a secondary school in one of the three major Greek urban centers – Athens, Piraeus or Salonica.

We expect this variable to correlate positively with the decision to CONTINUE and this correlation to be higher with the sub-decisions to attend a UNIVERSITY School or a SELECTIVE Faculty.

Family Background

This is one of the most tricky variables used in socio-economic research. One has two choices: a) to use a composite index reflecting several attributes of the student's household; b) to relate the decision to continue to single attributes of the household so as to assess their relative importance on the dependent variable. In this analysis we have mainly followed the second approach. The alternative variables we have constructed to measure the student's family background, mainly by a measure of his/her father's occupation, are listed below.

FARMER is a 0–1 dummy variable, the 1 corresponding to the fact that the student's father is a farmer.

OCC HIGH is a 0–1 dummy variable, the 1 corresponding to the fact that the student's father belongs to one of the highest occupations in terms of prestige (e.g., doctor, lawyer or manager of a big firm).

OCCF is a continuous variable measuring father's occupation on the Treiman (1975) international scale.

We expect the height of father's occupation to be positively related to the decision to CONTINUE and its variants.

Other household characteristics we measured include:

YFAM a continuous variable referring to the family's monthly income, and

HOUSE a dummy variable having a value of 1 if the family owns its house and 0 otherwise.

Family income and house ownership are expected to be positively related to the decision to CONTINUE.

SF and SM are continuous variables measuring the number of years of schooling of the student's father and mother respectively.

We expect father's and mother's education to be positively related to the decision to CONTINUE because of the parental push factor.

- SIBS** is a continuous variable measuring the number of brothers and sisters. We expect this variable to be negatively related to the decision to CONTINUE and its variants because of the increased financial strain on the family's budget.
- ROOM** is a continuous variable measuring the number of rooms per resident in the student's household. We expect this variable to be positively associated with the decision to CONTINUE because a crowded household would be less conducive to home study.
- FTIME and MTIME** are continuous variables measuring the amount of days per year the father and mother, respectively, talk with the student about schoolwork. We expect this variable to be positively related to the decision to CONTINUE and its variants since it reflects home coaching.

Intellectual Ability and Scholastic Achievement

In this sample we do not have an independent measure of the student's intellectual capacity (like an IQ test result) that we would expect to correlate positively with the decision to continue. What we have instead is a series of proxies for the student's scholastic achievement at three points in time: these are

- GRADEPRIM** the grade of graduation from primary school,
GRADESEC the overall grade at secondary school, and
GRADEREC the recent grade in secondary school. Furthermore, we constructed
- REPEATER** a 0–1 dummy variable, the value of 1 reflecting the fact that a pupil has repeated a class at some time during his school career. We expect the decision to CONTINUE to be positively related to the grades and negatively related to class repetition.

Economic Factors

Economic considerations can influence the decision to CONTINUE in several ways: first, via family income and its proxies. This is partly because students from well-to-do families are able to attend private preparatory

courses (“Frontisteria”) in order to attempt the competitive entrance examinations. Secondly, high family income means low marginal utility on money devoted to educational expenditures. Thirdly, the family could afford to wait regarding pecuniary contributions from the student to the household. By contrast, students from low income families would tend to discontinue their studies at the end of secondary education in order to support themselves and/or their families.

There exists another way economic factors enter the decision to CONTINUE, namely via the expected returns from university education. Those in the sample who planned to CONTINUE in Greece were asked what would be their expected earnings during the first five years of their career if they entered the school of their first choice.

Similarly they were asked to state their expected earnings had they acquired only the secondary school certificate. Thus we constructed the variables

YGRAD	to denote expected post-secondary graduate earnings and
YSEC	to denote expected earnings had the student not continued into further education.

Using these two variables we constructed a very rough proxy for the expected private rate of return to post-secondary education

$$R = \frac{YGRAD - YSEC}{4 \cdot YSEC}$$

We expected this variable to be positively related to the decision to study at the post-secondary level.

Perceptions and Attitudes

In this sample the student was asked to provide an answer to the question we were analysing, namely what were the reasons he did *not* plan to CONTINUE. Reason number one was that the student himself “felt unable to continue”. Thus we constructed an

UNABLE	0–1 dummy variable, the value of 1 corresponding to the above statement.
--------	--

It should be noted, however, that this variable is nearly tautological to the dependent variable we wish to explain. The emphasis in this analysis is on relating as far as possible objective variables (like family income) to the decision to CONTINUE rather than psychological variables.

However, another psychological variable we constructed is

MONEYDRIVE a 0–1 dummy variable, reflecting the fact that the student agreed to the following statement: “Making money is the most important thing in life.”

We expect this variable to correlate positively with the decision to continue, although it has to be examined in conjunction with the following finance variables (so as to see who has MONEYDRIVE):

WORKSNOW is a 0–1 dummy variable reflecting the fact that the student is working at the time of the interview and
WILLWORK is a 0–1 dummy variable, the 1 reflecting the fact that the student intends to work later on in order to finance his post-secondary school studies. Finally,
PRIVATE SCH is a 0–1 dummy variable, the 1 reflecting the fact that the student attends a private school.

TABLE I

Zero-order Correlation Matrix for the Entire Sample (N=7425)

	Cont.	Univ.	Select	Unable	Urban	Sex	House	YFAM	OCCF	Farm.	OCCHI
University	0.495										
Selective	0.193	0.389									
Unable	-0.616	-0.305	-0.119								
Urban	-0.037	0.094	0.123	0.025							
Sex	0.091	0.102	0.131	-0.092	-0.030						
House Owner	0.009	-0.025	-0.037	-0.003	-0.194	-0.008					
Family Income	0.034	0.079	0.153	-0.040	0.215	0.076	-0.084				
Father's Occupation	0.055	0.123	0.143	-0.027	0.238	0.001	-0.065	0.329			
Father is Farmer	-0.004	-0.088	-0.116	0.005	-0.395	-0.007	0.204	-0.261	-0.444		
Father has high occ.	0.061	0.101	0.122	-0.037	0.179	0.025	-0.049	0.332	0.645	-0.237	
Room	0.034	0.051	0.067	-0.027	-0.035	0.039	0.104	0.168	0.162	-0.037	0.165
Father's education	0.062	0.129	0.140	-0.030	0.221	0.018	-0.059	0.383	0.572	-0.323	0.541
Mother's education	0.076	0.116	0.141	-0.051	0.222	0.019	-0.046	0.408	0.462	-0.298	0.423
Number of Siblings	-0.038	-0.090	-0.067	0.015	-0.178	-0.011	0.035	-0.094	-0.174	0.249	-0.111
Attends private school	-0.027	-0.026	0.056	0.017	0.207	0.076	-0.036	0.242	0.208	-0.114	0.221
Repeater	-0.196	-0.254	-0.134	0.141	-0.041	0.097	-0.018	-0.051	-0.077	0.050	-0.081
Grade in primary	0.117	0.185	0.119	-0.082	0.149	-0.121	-0.026	0.113	0.151	-0.158	0.120
Recent grade in sec.	0.225	0.335	0.219	-0.177	0.081	-0.203	0.009	0.124	0.168	-0.104	0.160
Overall grade in sec.	0.250	0.353	0.234	-0.186	0.070	-0.185	0.003	0.123	0.172	-0.103	0.160
Father's dis. days	0.045	0.043	0.032	-0.031	-0.054	-0.092	0.022	0.019	0.081	-0.016	0.040
Mother's dis. days	0.002	0.003	0.002	0.002	0.027	-0.178	-0.011	0.027	0.101	-0.113	0.037
Money drive	-0.061	-0.089	-0.048	0.032	-0.054	0.065	0.009	-0.038	-0.032	0.044	-0.042
Works now	-0.051	-0.084	-0.056	-0.006	-0.034	0.236	0.028	-0.074	-0.136	0.146	-0.107

Table 1 gives the zero-order correlation matrix for all the above variables. Table II reports correlations between selected variables within sample sub-groups. These matrices contain a wealth of information about the socio-economic characteristics of a special group of Greek households (i.e. those that have children in the last two years of secondary school) [3].

III. The Propensity to Pursue Post-secondary Studies by Region, Sex and Father's Occupation

Let us first give a flavour of variations in the decision to continue by the three main exogenous variables in the sample, i.e., region, sex and father's occupation. Figure 2 presents a "tree breakdown" of the sample in this respect. This amounts to splitting up the grand mean of the sample (e.g. the propensity to continue, equal to 0.85) into sub-means referring to specific partitions of the sample according to some criterion (e.g. urban residence). By further splitting the sub-sample into smaller groups according

Room	SF	SM	SIBS	Pr.Sc.	Rep.	Grade P	Grade S	Grade S	F Time	M Time	Money drive
0.225											
0.244	0.590										
-0.265	-0.195	-0.246									
0.124	0.258	0.277	-0.112								
-0.016	-0.103	-0.101	0.075	0.045							
0.074	0.171	0.181	-0.123	-0.113	-0.233						
0.074	0.228	0.220	-0.108	0.073	-0.375	0.345					
0.078	0.222	0.214	-0.112	0.053	-0.397	0.351	0.848				
0.024	0.097	0.084	-0.077	-0.005	0.003	0.050	0.043	0.048			
0.033	0.069	0.163	-0.155	0.022	0.003	0.074	0.055	0.053	0.490		
-0.025	-0.055	-0.055	0.033	0.006	0.095	-0.076	-0.142	-0.142	0.009	0.013	
-0.040	-0.142	-0.158	0.120	0.002	0.146	-0.111	-0.169	-0.167	-0.027	-0.073	0.033

TABLE II

Zero-order Correlations between Selected Variables within Sample Sub-groups

Variable X_i	Subgroup	CONTINUE (N=6327) Corr (UNIV., X_i)	UNIVERSITY (N=4350) Corr (SELECT., X_i)
Urban school		0.14	0.12
Sex (male = 1)		0.07	0.12
Family is house owner		-0.04	-0.04
Family income		0.07	0.17
OCC F		0.12	0.13
Father is farmer		-0.11	-0.12
Number of siblings		-0.09	-0.05
Father's education		0.12	0.12
Mother's education		0.10	0.13
Primary school grade		0.16	0.07
Secondary school grade		0.29	0.14
Repeater		-0.21	-0.06
Money drive		-0.07	-0.02
Expected rate of return		-	0.27

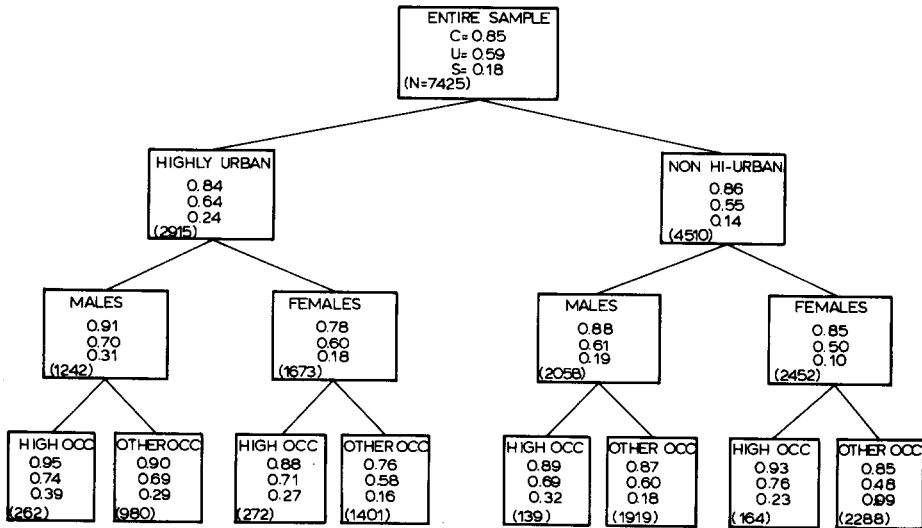


Fig. 2. The mean propensity to study at the tertiary level by region, sex and father's occupation. (C = Continue at the tertiary level in general, U = Continue to a University school, S = Continue to a selective university school).

to additional "exogenous" variables (such as sex or father's occupation), we obtain the mean value of the dependent "variable" we are interested in for particular population groups, controlling for selected exogenous variables. Also we can apply *t*-tests on the difference between sub-means.

In our case the rule of thumb is that a difference of about 0.04 points between sub-sample means is statistically significant at the 5 percent probability level. Thus regarding the mean propensity to CONTINUE in general, there exists no statistical difference between pupils living in the three major urban centres and the rest of the country (mean propensities 0.84 and 0.86, respectively). However, the urban distinction becomes increasingly relevant as one considers the horizontal decision to continue to a university school or a selective faculty.

Within a given urban context we observe that males have a higher propensity to continue than do females, especially regarding selective university cycles.

Having standardised for region and sex, we detect that the offspring of fathers in the top occupational stratum tend to pursue selective university cycles. By contrast, father's occupation makes little difference regarding the propensity to continue to tertiary education in general.

MAIN CHARACTERISTICS OF SAMPLE SUBGROUPS

Table III brings in additional variables and relates different mean characteristics to the decision to continue and its variants. The table is self-explanatory so the reader's attention is drawn to a few salient facts.

House ownership does not make a dramatic difference on the decision to continue. This is because the sample contains a large number of farmers (31%) and house ownership is highly correlated with farming.

Family income relates positively to the decision to continue abroad or to a selective faculty. By contrast, the lowest mean income is observed in the "unable" group and those who plan to seek a place in non-university schools like teacher-training and technical colleges. Therefore we get a first clue that low family income may contribute to self-selection as UNABLE or able to continue only at a non-university institution.

The two extremes of the *father's occupation* variable are observed between those who plan to continue at non-university schools and those who plan to continue at selective university faculties.

Attendance of *private school* is strongly related to continuation abroad which is of course a reflection of family income.

It is the *repeaters* who mainly felt unable to continue their studies at the tertiary level.

Although the differences in *grades* between groups appear to be small, the differences are statistically significant (for the effect of grade see following section).

TABLE III

Mean Value of Socio-economic Characteristics within Sample Sub-groups

Characteristic	Entire Sample	Discontinue	Thereof "Unable"	Continue Abroad	Continue in Greece		
					Non-University institutions	University Schools	Selective
	N=		(459)		1550	3041	1309
Urban (%)	39	44	44	45	24	39	52
Males (%)	44	33	27	70	33	44	59
Family owns house (%)	82	82	82	79	86	83	80
Family income (approx. US\$ per month)	268	251	236	384	210	258	337
Father's OCC (Treiman scale)	46.0	44.3	44.6	49.0	42.6	46.1	49.8
Father is farmer (%)	31	31	32	18	44	31	19
Father has HIGH OCC (%)	11	7	7	21	4	12	20
Rooms per house resident	0.85	0.83	0.82	0.95	0.81	0.85	0.90
Father's years of schooling	7.2	6.7	6.8	8.6	6.1	7.3	8.4
Mother's years of schooling	5.8	5.1	5.1	7.3	4.9	5.8	6.8
Number of siblings	1.8	1.9	1.9	1.8	2.1	1.8	1.6
Attends private school (%)	14	16	17	33	10	11	18
Repeater (%)	24	44	47	33	33	16	11
Grade in secondary school	14.8	13.6	13.4	14.6	14.1	15.2	15.8
Father's days discussed schoolwork	162	145	144	145	163	166	173
Mother's days discussed schoolwork	201	200	202	180	206	201	201
Has money drive (%)	35	42	41	34	40	32	30
Works now (%)	15	20	15	18	19	14	11
Will work to finance studies (%)	-	-	-	-	7	7	4
Expected secondary monthly salary (US\$)	-	-	-	-	101	105	112
Expected graduate monthly salary (US\$)	-	-	-	-	171	208	279
Expected rate of return	-	-	-	-	20	28	44

Note: - not available.

Moneydrive is mainly an attribute of those who plan to discontinue their studies or enter non-university schools. The latter group also has one of the highest working percentage concurrently to the secondary school studies (19%). Those who plan to enter selective cycles work least during their secondary school studies, plan to work least in order to finance themselves in the university and also have the lowest moneydrive.

The last three rows of Table III show that expected earnings are an increasing function of university plans and that those planning to graduate from selective cycles expect about double the returns of those planning to enter non-university schools.

IV. Results of Multivariate Analysis

Tabulations such as those presented above are very useful in discovering crucial relationships in a sample but they have their limitations regarding control for other factors. For this reason we now proceed to multivariate analysis in an effort to assess what are the most crucial factors affecting the decision to continue and its variants.

Preliminary statistical analysis limited considerably the amount of *independent variables*. For example, we found that it is the overall grade in secondary school that relates mostly to CONTINUE, rather than the primary school grade or the recent grade (see Table I). We thus used only GRADESEC in the analysis that follows. The other factors we retained are sex, urban residence, family income and MONEYDRIVE.

These independent variables were used to explain the three decisions CONTINUE, UNIVERSITY or SELECTIVE, plus the UNABLE self-selection confession.

The nature of the dependent variable in this case poses an awkward statistical problem. The fact that it is a 0–1 dummy means two things: first, predicted values of the dependent variable (which can be interpreted as a probability for the particular event to take place) can lie outside the usual 0–1 probability range (i.e. the predicted value can exceed unity or be negative). Second, the fact that the values of the observations for the dependent variable are limited between two bounds (0 and 1) creates heteroskedasticity in the distribution of the residuals in an ordinary least squares regression and thus the t-tests of the Ordinary Least Squares estimated coefficients become meaningless.

In recent years this problem has been solved by using the maximum likelihood estimation technique which ensures predicted probabilities within the 0–1 interval and asymptotic efficiency and consistency of the resulting parameters [4]. This amounts to specifying a logit transformation

$$\ln \frac{P}{1-P} = \sum_i \beta_i X_i \quad \text{or}$$

$$P = \frac{1}{1 + e^{-\sum_i \beta_i X_i}} \quad (1)$$

where P is the probability of an individual belonging to one of the groups denoted by our four dependent variables, X_i is one element of the vector of the five independent variables and β_i is the regression coefficient of the log of the odds estimate. What we are interested in, however, is the "marginal effect", i.e. the change in the propensity or probability to continue after a change in one of the independent variables. This is found by simply differentiating (1) with respect to X_i and getting

$$\frac{\partial P}{\partial X_i} = \beta_i (1 - P) P \quad (2)$$

where the first term in the right-hand side of this expression is the maximum likelihood estimate of the coefficient on X_i by fitting the logit.

Table IV reports for each function and independent variable the maximum likelihood estimate, the t -ratio (in parenthesis) and the percentage marginal effect (underlined). *Sex* is a sizeable and statistically significant variable in all regressions. For example, being male, *ceteris paribus*, increases the propensity to continue to tertiary education by 11.8 percentage points. Similarly, being male decreases the probability of someone self-selecting himself as unable to continue by 7.1 percentage points.

Urban residence is negatively related to the propensity to CONTINUE and positively related to UNABLE, UNIVERSITY and SELECTIVE.

One rather surprising finding is that *family income* is not a significant variable regarding the propensity to CONTINUE, to self-classification as UNABLE or wishing to continue at a UNIVERSITY type institution. But family income is a significant determinant of the propensity to continue at a SELECTIVE university faculty.

The *secondary school grade* has the expected sign and the highest t -ratio among all independent variables. Every extra grade in secondary school increases by 5.6 percentage points the propensity to CONTINUE and by 10.8 points the propensity to continue to a UNIVERSITY school. By contrast, it decreases by 2.8 points the probability of someone classifying himself as UNABLE.

TABLE IV

Maximum Likelihood Estimates of the Decision to Continue and its Variants

Dependent Variable Mean Response (%)	CONTINUE 85	UNABLE 6.2	UNIVERSITY 59	SELECTIVE 18
Constant term	-1.467	4.569	-6.667	-8.078
Male	0.922 (12.9)	-1.223 (11.1)	0.873 (16.8)	0.999 (15.4)
Urban Resident	<u>11.8</u> -0.349 (5.0)	<u>-7.1</u> 0.364 (3.6)	<u>2.1</u> 0.345 (6.5)	<u>14.7</u> 0.543 (8.4)
Family Income (000 drs)	<u>-4.4</u> 0.00026 (0.51)	<u>2.1</u> -0.0153 (1.78)	<u>8.3</u> 0.00024 (0.65)	<u>8.0</u> 0.0245 (6.5)
Grade in Secondary School	<u>0.003</u> 0.437 (22.3)	<u>-0.089</u> -0.488 (16.8)	<u>0.006</u> 0.446 (29.8)	<u>0.400</u> 0.366 (20.0)
Moneydrive	<u>5.6</u> -0.216 (3.1)	<u>-2.8</u> 0.117 (1.1)	<u>10.8</u> -0.220 (4.1)	<u>5.4</u> -0.098 (1.4)
	<u>-2.8</u>	<u>0.7</u>	<u>-5.3</u>	<u>-1.4</u>

Notes:

First number is the regression coefficient of the logit model (β_i).Numbers in parentheses are *t*-ratios.

Underlined numbers are the marginal effects of each independent variable (in percentage

points) on the dependent variable $\frac{\partial P}{\partial X_i}$.

All functions have highly significant likelihood ratio statistics.

Finally, MONEYDRIVE is significant in only two cases, namely in continuing to tertiary education in general and in selecting a university school.

THE DETERMINANTS OF SCHOLASTIC ACHIEVEMENT

Because of the importance of secondary school grade in determining firstly whether or not the student continues with his or her education and secondly, what kind of continued education is chosen, we ask the further question of what determines scholastic achievement. Table V shows the results of an educational production function, fitted by ordinary least squares, where the "product" is narrowly defined as the secondary school grade. The list of dependent variables includes individual, school and family characteristics.

In the first place, a number of factors that we would expect to relate

TABLE V

The Determinants of Secondary School Grade (Ordinary Least Squares Estimates)

	Regression Coefficient	Standardised Beta Coefficient
Constant Term	14.53	
Urban Resident	-0.040*	
Male	-0.753	-0.188
Family Income (000 drs)	0.0095	0.036
Private School	-0.054*	
Room in the House	0.035*	
Number of siblings	-0.077	-0.057
Father's years of schooling	0.070	0.132
Mother's years of schooling	0.063	0.111
Father's discussion time	0.00018*	
Mother's discussion time	-0.0003*	
Money drive	-0.475	-0.114
R ²	0.11	
N	7425	

Notes: The dependent variable is GRADESEC

* *t*-ratio less than 2.0

to school performance are not statistically significant. These are urban location of school, the fact that the school is private, the amount of room per resident in the house and the frequency of parents' discussion with the pupil about homework. By contrast, sex plays a very important role (the negative coefficient indicating that girls do better than boys), family income relates positively to school grades and the number of brothers and sisters acts as a depressor on measured school performance. The level of education of the father is a more important determinant of school performance relative to the level of education of the mother, possibly because the former picks up other family attributes (like father's occupation) that relate positively to school performance. Finally, money drive relates strongly and negatively to the secondary school grade, perhaps indicating that those who consider money very important come from poor families and therefore are diverted from schoolwork in order to engage in other household (or labour market) activities.

The last column in Table V shows the Standardised Beta Coefficients corresponding to the statistically significant variables. The size of these coefficients suggests that the two most important variables that determine the grade in secondary school is sex and father's education.

V. Discussion of the Results

In this paper we have considered the further study (or interruption of study) plans of a large sample of pupils in the last two years of secondary school in Greece and attempted to “explain” these plans by means of certain socio-economic variables. The study plans were divided into three (overlapping) decisions; first, to “continue” or not into some form of post-secondary education; second, to continue by enrolling at a “university” school; third, to continue by enrolling at what we called a “selective” university school. In addition we tried to discover the factors responsible for a pupil classifying him (or her) self as “unable” to continue to any form of post-secondary education. The explanatory factors used for analysing these decisions could be grouped into the following, understandably not mutually exclusive, sets:

- A. Personal characteristics and attitudes
 - sex
 - number of siblings
 - working while studying
 - money drive
- B. Family characteristics
 - family income
 - father’s occupation
 - parent’s level of education
 - parent’s involvement in school work
- C. School-related characteristics
 - type of school (public or private)
 - region (urban or rural)
 - grades
 - repeater

Among all factors used to explain further study plans there was a single one that dominated all others: the average level of grade in secondary school. This factor was especially effective (as judged from the statistical significance) in classifying oneself as “unable” to continue to post-secondary education. High family income and urban residence did not appear to have a great impact on the decision to “continue” in general. But they were more effective in developing aspirations towards study at a “selective” university faculty.

Given the importance of secondary school grades in explaining further study plans we asked the question of what is likely to determine these grades. The statistical analysis revealed that parents’ education is a very important factor in this respect. This finding gives us a clue as to the process of transmission of educational aspirations, namely that more educated parents push

their children to obtain high grades and thus make it easier for them to continue into all forms of post-secondary education.

Another finding of our "educational production function" worth noting is that while parents' education is an important determinant of school achievement, the actual involvement of parents in the pupil's homework is not a statistically significant variable. This finding throws some light on the process of how home inputs influence school achievement. Environmental vocabulary, discussion, everyday-life contacts and the general family ambience the child is exposed to are more important factors than the actual time a parent spends over the child's shoulder in supervising and checking his homework.

Finally, in interpreting these results one should bear in mind the following qualifications. First, we have dealt with a very select group, i.e. those who have reached the end of secondary school. Since prior selection has already taken place, the fact that one variable (say urban residence in determining the level of grades) has not been important in this group does not mean that it has not been important to determine the very fact that a particular pupil belongs to this sample. Second, the feeling that a given factor (say, family income relative to grades) has been less important than others in determining the decision to "continue" does not necessarily mean that family income is unimportant in this process. For example, the first equation in Table V shows that, other things being equal, provision of a 1,000 drachmas (US\$363) monthly stipend to those coming from poor families will boost their propensity to enrol for higher education by a mere 0.003 percent. This result, however, simply shows that family income is not an effective policy instrument within the existing variation of incomes and costs of education. In other words it cannot show that if fees were raised dramatically this could not have an effect on the propensity to continue.

Acknowledgement

The authors wish to thank Mark Blaug and an anonymous referee for useful comments on a first draft of this paper and the OECD for providing the data.

Notes

- 1 The data were collected, coded and put on tape with the collaboration of the Greek National Centre for Social Research.
- 2 Even this distinction is not watertight for, given time, sex-role stereotypes could be changed by a programme of professional orientation.

- 3 For additional cross-tabulations between these and other variables in the sub-sample of those who are in the last class of secondary schools, see Soumelis (1978).
- 4 See Heckman (1976). We are indebted to Ben Knox for making the logit routines available to us and to Steve Nickell, Zmira Prais and Hugh Wills for useful discussions on the statistical properties of the model.

References

- Härnqvist, K. (1978). *Individual Demand for Post-Secondary Education*, Vol. I, Paris: O.E.C.D.
- Heckman, J. R. (1976). "Introduction," *Annals of Economic and Social Measurement* Special Issue on Discrete, Qualitative and Limited Dependent Variables, 5: No. 4.
- O.E.C.D. (1976). "Survey Questionnaire: Case Study Greece," SME/ET/76.22, Appendix B, mimeo.
- Soumelis, C. (1978). "Case Study: Greece," in *Individual Demand for Post-Secondary Education*, Vol. II, Paris: O.E.C.D. (in press).
- Treiman, D. (1975). "Problems of concept and measurement in the comparative study of occupational mobility," *Social Science Research*, 4: 183–230.