Determinants of the demand for education in Spain

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The aim of this paper is to estimate an equation for household demand for both secondary and university education, using an estimation of the opportunity cost associated with the decision to invest in education. Limited dependent variable models are applied to the data provided by the Family Budget Survey 1991 for Spain. The results show that the social and economic status of the family has a comparatively greater impact on household expenditure on secondary education than on university education. The opportunity cost is also shown to be a decisive variable in the decision to invest in secondary education, although the results are less conclusive in the case of university education.

I. INTRODUCTION

The study of education from an economic viewpoint is of interest for various reasons, among them the effect of education on the reduction of inequalities of income (Ram, 1989), or the relationships between education and labour market. Many approaches have been made to the latter subject, from studies of the rate of return of education (see for example Psacharopoulos and Woodhall, 1987; Al-Qudsi, 1989; Kugler and Psacharopoulos, 1989; Psacharopoulos, 1989) to those that study the differences between the educational level of employees and that required for a specific job, i.e. the phenomenon of over-education (see for example Verdugo and Verdugo, 1989; Alba-Ramírez, 1993; or Beneito *et al.*, 2000). This article studies the main factors that influence the demand for education in Spain. The analysis considers the demand for education as dependent on the opportunity cost or the alternative value of the time devoted to studying. This cost will, in turn, be related to the conditions of the labour market and will depend on the average income expected by

an individual who decides to enter the labour market and not to study.

On the basis of the information provided by the Family Budget Survey 1991, this study analyses the determinants of the expenditure of Spanish households on noncompulsory levels of education (secondary and university education).[1] In the present study it is assumed that the decision to spend on education is made by the head of the family for the members of the household. Although household expenditure on education constitutes an ordinary expenditure item, it is also true that this expenditure has also to be considered as a personal investment option.

It is obvious that one of the most powerful influences on the private demand for secondary and university education is the household income level and the cost incurred by a family when it takes the decision to invest in education. The economic evaluation of this cost requires strictly financial criteria to be set aside and concentration on the concepts of 'opportunity cost' or 'shadow cost' of education, i.e. considering what income is lost by an individual (and his family) when he/she decides to devote his/her time to

[1] An analysis for the UK, centring on the determinants of the percentage of students continuing from one educational level to the next, can be found in Pissarides (1982). A theoretical framework for analysing decisions on choice of studies can be found in Lankford and Wyckoff (1992).

studying. The earnings thus sacrificed are usually determined on the basis of the average income of employed graduates from the educational level immediately below that chosen for study. This measurement, however, may be overestimating the true opportunity cost if it does not consider the individual's chances of being employed or not. The calculation of such average income and of such probabilities is one of the objectives of this study.

In studies of household demand for education, the importance of social and economic factors in the determination of expenditure on education is generally accepted. Indeed, aspects such as the parents' education, the geographical location of the place of residence, the size and composition of the family, the occupation of the primary earner, or even the family's own consideration of its social status, are factors that help to explain the different values each family places on education. In fact, another objective of the study is to determine the social and economic profile of what could be called 'educogenous' families (Anderson, 1983), i.e. families that are marked by a strong taste for the education of their members. The inclusion of these types of variables, labelled 'environmental', also serves to approximate the student's individual 'capacity' – to transform expenditure into education – which is due to 'non-innate' factors.

The study is structured as follows. Section II presents the theoretical basis of the problem and the econometric model to be estimated. The estimation will be done by specifying a Tobit model due to the existence of a large number of zero expenditures. Section III is devoted to the data and definition of the variables included. Section IV presents the results for the opportunity cost or shadow price of education, after estimating by means of a multinomial logit the probabilities of being unemployed or not. These estimations, together with the income variable and environmental variables, will be used in the final estimation of the private expenditure on education. Finally, Section V concludes.

II. THEORETICAL AND ECONOMETRIC FRAMEWORK

Theoretical model

To study the determinants of expenditure on education by educational levels the family demand function of education derived from a family utility function (Nicaise, 1992) was utilized. If the family unit is defined as the individual or group of individuals who consume and/or share goods and services paid for out of a common budget, it can be assumed that, in each of these family units or households, there exists a 'decision-maker', decisions on how much to spend and on what being taken basically by him/her. The decision-maker of household h has a utility function:

$$U_h(x_{ih}, \hat{h}_{jh}, E_h) \qquad (1)$$

where: x_{ih} ($i = 1, \ldots, I$): goods and services, excluding education, consumed by family h; $\hat{h}_{jh}$ ($j = 1, \ldots, J$): educational activities carried out by J members of family h in the period considered. If the number of members of a family is denoted by M, then $J \leqslant M$; E_h: 'environmental' factors that may affect the decision maker's utility. Among such factors would be the decision-maker's educational level, his/her professional category and work situation, region of residence, social class and gender.

It is observed that both the decision-maker's consumption of goods and services and that of the other members of the household enter as arguments into the former's utility function. That is to say, it is assumed that the links between the decision-maker and the other members of the family that justify the fact that these individuals pool their budget in order to share consumption, also justify the fact that the consumption of each and every one of the members of the family unit brings well-being to the decision-making individual. In this sense, Equation 1 can also be understood as a family utility function.

As to educational activity, there is an intuitive direct positive relationship between utility and the level of education achieved by the members of the household. However, unlike immediate consumption of goods, qualifications cannot be bought. Money has to be spent on registration in different teaching centres, regular teaching fees, expenditure on complementary educational activities, on books, materials and on all those goods and services that the individual requires to carry out the learning process. According to Rodriguez-Gutierrez (1992) the student can be considered as a productive agent who transforms this expenditure into qualifications, through the following educational production function:

$$\hat{h}_{jh} = A \cdot h_{jh}^k \quad 0 < k < 1 \qquad (2)$$

where A is the scale parameter; $\hat{h}_{jh}$ is the additional level of education incorporated by individual j of household h in the period analysed; h_{jh} denotes the expenditure on educational activities made by family h for the benefit of individual j; and k is a parameter that measures the 'capacity' of the individual to transform expenditure into education effectively acquired. Diminishing returns, $k < 1$, are assumed, because it is to be expected that from a certain threshold of expenditure on acquisition of knowledge the individual's capacity of assimilation will diminish and the marginal gains in terms of human capital or education acquired will be increasingly smaller in relative terms.

The key element in the educational production function is the parameter k. This parameter determines the transformation of expenditure on education into human capital. As k increases, the return on a given expenditure on education also increases. Therefore, k captures all those factors that determine the individual's aptitude and attitude for study,

both his/her innate capacity and non-innate capacities determined by the environment in which he/she lives, the external stimuli received, etc. Given the difficulty of measuring innate capacities, these can be approximated through the same factors included in E, the environmental factors.

Consequently, the aim of the decision-maker is to maximize the family utility function subject within (i) the restriction that expenditure on goods and services consumed, including education, does not exceed the family income; and (ii) the restriction imposed by the educational production function of the individual student.

Formally, the demand for education is expressed in terms of the following maximization problem:

$$\max U_h(x_{ih}, \hat{h}_{jh}, E_h) \qquad (3)$$

$$\text{s.t.} \quad \sum_i x_{ih} p_i + \sum_{j=1}^{J} h_{jh} =$$

$$\sum_{j=1}^{M} w_{jh} L_{jh} + \sum_{j=1}^{M} Z_{jh}$$

where $\hat{h}_{jh} = A \cdot h_{jh}^{k}$

$\sum_j Z_{jh}$ being the exogenous (unearned) income of the family, and $\sum_j w_{jh} L_{jh}$ a measure of what a family receives for activities related to the labour market.[2] The time spent by a family on remunerated activity L is inversely related with the time the family spends on the education of its members. Consider:

$$\sum_{j=1}^{M} L_{jh} = \sum_{j=1}^{M} \bar{L}_{jh} - \sum_{j=1}^{J} T_{jh} \qquad (4)$$

where $\bar{L}_{jh}$ represents the total potential working hours of individual j, and T_{jh} is the time devoted to education by each member of the family. Assume:

$$T_{jh} = \bar{L}_{jh} \quad \text{if} \quad T_{jh} > 0 \quad (j = 1, 2, ..., J) \qquad (5)$$

if the individual decides to invest in (formal) education he/she ceases to belong to the employed population, income from the labour market ($w_{jh} L_{jh}$) becomes zero, and the opportunity cost is given by:

$$w_{jh} T_{jh} = w_{jh} L_{jh} \qquad (6)$$

The model assumes that all the students study full time. The Lagrangian of the above problem of conditioned optimization can be written as:

$$L = U_h(x_{ih}, A h_{jh}^{k}, E_h) + \lambda(\sum_j w_{jh} \cdot (\bar{L}_{jh} - T_{jh})$$

$$+ \sum_j Z_{jh} - \sum_i x_{ih} p_i - \sum_j h_{jh}) \qquad (7)$$

The first order conditions will lead to the corresponding demand functions for goods and for education, which can be synthesized as follows:

$$x_{ih} = x_{ih}\left(p, \left(\sum_{j=1}^{M} w_{jh} L_{jh} + \sum_{j=1}^{M} Z_{jh} \right), \sum_{j=1}^{J} w_{jh} T_{jh}, E_h \right) \qquad (8)$$

$$h_{jh} = h_{jh}\left(p, \left(\sum_{j=1}^{M} w_{jh} L_{jh} + \sum_{j=1}^{M} Z_{jh} \right), \sum_{j=1}^{J} w_{jh} T_{jh}, E_h \right) \qquad (9)$$

where $p = (p_1, \ldots, p_I)$ is a price vector corresponding to goods and services other than education, and w_{jh} the hourly wage of individual j.

Equations 8 and 9 form system demand equations, including both demand for education and for other goods and services. Observe that the arguments appearing in the education demand function are the vector of prices for goods and services other than education, the earned income of the family members who do not study full time ($w_{jh} L_{jh}$), other income not obtained from work (Z_{jh}), environmental variables (E_h) and the opportunity cost associated with education borne by the family ($\sum w_{jh} T_{jh}$). The assumption of the separability of goods (education on the one hand, and all other consumer goods and services, on the other) enables the education demand equation to be estimated separately.

Econometric model

The private demand for education can be estimated using cross-sectional data, and it seems reasonable to assume that for the same period all individuals face the same prices, with the exception of possible differences between regions, an effect which will be controlled indirectly by means of regional dummy variables. The demand function that interests us (ignoring prices, as these are the same for all households) is expressed as:

$$h_{jh} = h_{jh}\left(\left(\sum_{j=1}^{M} w_{jh} L_{jh} + \sum_{j=1}^{M} Z_{jh} \right), \sum_{j=1}^{J} w_{jh} T_{jh}, E_h \right) \qquad (10)$$

The observation of family expenditure on education presents the problem of zero expenditures. Families with members in a position to study may decide not to spend on education for a number of reasons, both monetary and environmental. Consequently, it will be necessary to analyse the problem taking into account, first, whether a decision is taken to spend on education, and second, how much is spent. Otherwise, inconsistent estimators would be obtained, due to the biases deriving from the endogenous selection of the sample. For this reason, to estimate the

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[2] The remuneration related to the labour market (w) includes both income received from working and that received in a situation of unemployment. For the moment, consider w to be the sum of this income per hour.

private demand for education, the following Tobit model is specified:

$$h^*_{jh} = h_{jh}\left(\left(\sum_{j=1}^{M} w_{jh}L_{jh} + \sum_{j=1}^{M} Z_{jh}\right), \sum_{j=1}^{J} w_{jh}, T_{jh}, E_{nh}\right) + u_{jh}$$

(11)

h^*_{jh} being a latent variable such that:

$$h_{jh} = h^*_{jh} \quad \text{if} \quad h^*_{jh} > 0$$
$$h_{jh} = 0 \quad \text{if} \quad h^*_{jh} \leqslant 0$$

where the disturbances u_{jh} are independent and identically distributed according to a $N(0, \sigma^2)$.

III. DATA AND VARIABLES

Data

The data used in the estimations are taken from the Spanish Households Budget Survey (EPF) 1991. This survey provides cross-sectional observations on expenditure and environmental characteristics for a sample of more than 20 000 Spanish families. The survey allows the extraction of all the information necessary to construct the variables intervening in the different econometric specifications used in this study.

The estimation of household private expenditure on education has been done separately for two levels of education: secondary or upper-secondary education (three years for the certificate of higher education (BUP), an additional year for those students who plan to enter university (COU), and First and Second grades of Vocational Training (FP-1 and FP-2)), and university education (education in university schools and university faculties).[3] Two samples are distinguished and two different dependent variables considered: for the sample of families with potential secondary students, this study takes into account the household expenditure on secondary education divided by the number of members of the household who are in secondary education or in a position to enter it; for the sample of families with potential university students, the household expenditure on university education divided by the number of members of the household who are in university education or in a position to enter it is considered. Expenditure includes matriculation and registration fees, regular payment of teaching fees and the cost of textbooks and study material.

Variables

Opportunity cost. Among the explanatory variables of the Tobit model described in Equation 11, the opportunity cost or shadow price of education deserves special mention. It is important in the decision on the time (T) that the household devotes to studying. This variable has had to be constructed on the basis of the estimation of probabilities and the prediction of the income associated with different possible employment situations. The calculation of this variable constitutes in itself one of the basic aims of this study, even though it is in turn an intermediate stage necessary for the determination of the main factors in determining expenditure on education.

The opportunity cost, understood as the income not received by an individual as a result of his/her decision to study, can be estimated as the average income received by those individuals with similar personal characteristics who do belong to the active population and who are therefore not studying. If an individual, instead of choosing to study, chooses to belong to the active population, he/she could find him/herself in one of the following situations: belonging to the employed active population (EP); belonging to the unemployed active population with work experience (UPE); or belonging to the unemployed population without work experience (UPNE). The individuals who belong to group EP receive income for their work, whereas the individuals belonging to group UPE may or may not be receiving unemployment benefit. Finally, the individuals belonging to group UPNE are considered not to be receiving any kind of income which has to be forfeited when deciding to study. Furthermore, also using the information referring to individuals of the active population, a probability of belonging to each of the above-mentioned categories can be associated to each individual. Having estimated these probabilities, each individual in a position to study is assigned probabilities in terms of his/her vector of personal characteristics. Therefore, the opportunity cost can be defined as the product of these probabilities and the income expected in each case, given the personal characteristics of each individual. It thus becomes necessary to estimate the income associated with each labour situation (EP or UPE) on the one hand, and the probabilities of belonging to each group on the other.

Income in each situation was estimated through the following equations, estimated by OLS:

$$Y_{EP_g} = D_g\beta_1 + u_{EP_g} \qquad (12)$$

$$Y_{UPE_g} = D_g\beta_2 + u_{UPE_g} \qquad (13)$$

where Y_{EP_g} is the income received by individual g, when employed, and Y_{UPE_g} is the income received by the individual when he/she belongs to the unemployed active population with work experience (unemployment benefits or similar). D_g is the vector formed by the variables age, gender, region of residence and level of education completed. The samples of individuals used for each regression

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[3] The appendix gives details of the selection of the sample in each case, and of the construction and number of the variables.

and the precise definition of the variables in D_g are detailed in the Appendix.

To calculate the probabilities of belonging to each of the employment situations considered, a multinomial logit model was estimated, grouping the population into four categories according to whether the individual belongs to PE, to UPE, to UPNE, or to none of these categories.

Finally, to estimate the probabilities of receiving any kind of payment conditioned to belonging to the category of unemployed, a logit model is specified with a dependent variable that takes the value zero if the individual does not receive unemployment benefit and one if he/she does receive some relief associated with his/her unemployed condition.

After the above estimations the opportunity cost of the education of individual j of family h can be calculated as the sum of the average incomes estimated in each labour situation weighted by the corresponding probabilities and deducting the amount of grants, in accordance with the following expression:

$$E(w_{jh}T_{jh}) = \text{pr\^ob}(jh \in \text{EP})\hat{Y}_{\text{EP}_{jh}} + \text{pr\^ob}(jh \in \text{UPE})$$
$$\times \text{pr\^ob}(\text{receive unemployment relief}/$$
$$jh \in \text{UPE})\hat{Y}_{\text{UPE}_j} - GRANTS \quad (14)$$

where j is an individual of family h aged 14 years or more and 26 years or less, with EGB (Basic General Education) completed. The variable *GRANTS* consists of income from study grants which therefore has to be deducted from the opportunity cost incurred by the individual who decides to invest in education.

Other variables. Together with the opportunity cost, another of the most important variables in the explanation of private expenditure on education is obviously the household income, understood as the total flow of monetary income, which is devoted to cover the common expenses of the family and are obtained by all the income earners in it.

In addition to total family income, another group of variables is taken into account that attempt to approximate both the capacity of young people for study in a broad sense, captured in parameter k, and the environmental circumstances that surround the family in its decision making. By 'capacity' one understands both the individual's innate aptitudes and those that he/she develops, induced by the environment in which he/she moves. The measurement of the innate qualities is not possible with the data and so that environmental variables are used again to approximate at least the non-innate capacity. Some of these environmental characteristics are: the social class to which the students belong, the employment situation of the decision-maker in the family unit, his/her occupational category, his/her educational level, and the size and region of the place of

residence. Thus, the inclusion in the model of the group of variables denoted E is doubly justified: first, because this type of variable affects the decision-maker's utility function, second, these variables approximate the capacity and disposition of the student towards study and therefore condition the student's rate of return to the amount spent on his/her education.

IV. RESULTS

Estimation of the opportunity cost

Table 1 presents the estimates of income for employed persons corresponding to Equation 12. The coefficient of the gender variable (*Female*) is negative and significant, showing that the average income obtained by working women is, given the age, the area of residence and the qualifications, more than 150 000 pesetas per year lower than that obtained by men. The age has a positive impact on income and it can also be noted that, in general, the workers of all the regions included in the regression receive an average income lower than that of the East Coast area, which is the reference category. It can also be seen that the individual's level of studies (*Stud2* and *Stud3*) is also sig-

Table 1. *Estimations of the income equations*

Variable	Employed (Y_{EP})	Unemployed with experience (Y_{UPE})
CONST.	−334 340**	143 210*
	(−5.472)	(1.723)
SEX	−159 340**	15 771
	(−10.991)	(0.857)
AGE	53 686**	6 558*
	(19.867)	(1.775)
NORTH	−84 459**	24 429
	(−3.641)	(0.768)
N-EAST	−2 203	31 301
	(−0.083)	(0.702)
ISLANDS	−61 760**	82 178
	(−1.966)	(0.957)
SOUTH	−116 690**	−13 281
	(−5.332)	(−0.475)
MADRID	−1 642	23 792
	(−0.047)	(0.350)
CENTRE	−61 104**	57 626
	(−2.846)	(0.620)
STUD2	113 350**	55 782**
	(6.149)	(2.049)
STUD3	329 530**	4 719
	(13.314)	(1.090)
Adjusted $R^2 = 0.21$	$N = 3635$	$N = 354$

Notes: ** Significant at the 5% level; * Significant at the 10% level.
The individual of reference is male, residing in the Mediterranean coastal region, who has completed EGB BUP or FP-I. Heteroscedasticity robust. *t*-ratios in parentheses.

Table 2. *Multinomial logit estimates*

Variable	Employed (EP)	Unemployed with labour experience (UPE)	Unemployed without labour experience (UPNE)
CONST.	1.740**	−0.556	2.631**
	(5.28)	(−1.33)	(6.16)
FEMALE	−1.839**	−1.325**	−1.286**
	(−18.95)	(−11.42)	(−10.71)
AGE	0.068**	0.080**	−0.116**
	(4.77)	(4.48)	(−6.18)
NORTH	−1.099**	−0.535**	0.329
	(−7.56)	(−2.97)	(1.61)
N-EAST	−0.025	−0.142	0.518*
	(−0.13)	(−0.56)	(1.88)
ISLANDS	−0.920**	−0.601**	−0.345
	(−5.05)	(−2.58)	(−1.22)
SOUTH	−1.034**	−0.360**	0.548**
	(−7.52)	(−2.14)	(2.83)
MADRID	−0.521**	−0.585*	−0.153
	(−2.25)	(−1.88)	(−0.43)
CENTRE	−0.751**	−0.461**	0.290
	(−5.32)	(−2.61)	(1.43)
STUD2	0.723**	0.146	0.696**
	(5.65)	(0.90)	(4.20)
STUD3	0.844**	−0.229	1.530**
	(4.99)	(−0.97)	(7.51)
		N = 6055	

Notes: ** Significant at the 5% level; * Significant at the 10% level.
The individual of reference is male, residing in the Mediterranean coastal region, who has completed EGB, BUP or FP-I. Heteroscedasticity robust. *t*-ratios in parentheses. Omitted category: inactives

nificant, its influence on the determination of income being greater the level of studies reached.

The estimated income equation for unemployed with work experience corresponding to Equation 13 is also shown in Table 1. As expected, the magnitude of the unemployment benefit received by an individual does not depend on the region of residence, as can be observed from the lack of statistical significance of the regional variables in the regression. Conversely, the coefficient of the age variable is significant and positive, which is probably a consequence of the positive correlation between age and the time the individual has been paying contributions before becoming unemployed.

The coefficients obtained in the above regressions will be used in the prediction of income in each employment situation (Y_{EP_j}, Y_{UPE_j}) corresponding to the individuals who, being either students or in condition to be so, belong to the families constituting the sample studied in the education demand Equation 11. These predictions will then be substituted in Equation 14 to estimate the opportunity cost.

Table 2 offers the results of the estimation of the probabilities of belonging to each category of the active population: employed (EP), unemployed who have worked previously (UPE), and unemployed who have never previously been employed (UPNE). As mentioned earlier, a multinomial logit model was estimated in which the omitted category was the group of individuals who are not active population.

However, the coefficients of the multinomial logit specification that appear in Table 2 do not allow an intuitive interpretation, so Table 3 presents the marginal probabilities associated with each explanatory variable, which can be interpreted as the rate of variation of the probability that an individual belongs to the category in question when the corresponding explanatory variable varies.

The following conclusions can be drawn from Table 3: the fact of being a woman decreases the probability of belonging to the categories of employment but increases the probability of being unemployed or out of the labour market. Living on the Cantabrian coast (*NORTH*) increases the probability of being unemployed without work experience, reducing considerably the probability of being employed. However, the marginal probabilities associated with the dummy variable for the *NORTH EAST* are very small and mainly not significant. This is interpreted as the absence of marginal changes in the probability of being employed or unemployed with experience that would be experienced by an individual who left the *EAST COAST* to live in the *NORTH EAST*. The same interpretation can be used to the case of Madrid. The inhabitants of the southern region of Spain also show a lower probability

Table 3. *Estimated marginal probabilities*

Variable	Inactive	Employed (EP)	Unemployed with labour experience (UPE)	Unemployed without labour experience (UPNE)
CONST.	−0.141**	0.261**	−0.247**	0.126**
	(−5.51)	(3.52)	(−5.29)	(3.37)
FEMALE	0.159**	−0.208**	0.026**	0.023**
	(12.92)	(−10.8)	(2.31)	(2.75)
AGE	−0.005**	0.015**	0.005**	−0.015**
	(−3.99)	(4.71)	(2.33)	(−7.57)
NORTH	0.080**	−0.219**	0.030	0.108**
	(6.99)	(−6.64)	(1.48)	(6.52)
N-EAST	−0.002	−0.027	−0.020	0.050**
	(−0.18)	(−0.63)	(−0.74)	(2.39)
ISLANDS	0.075**	−0.129**	0.016	0.038**
	(5.09)	(−2.94)	(0.53)	(2.04)
SOUTH	0.071**	−0.234**	0.041**	0.121**
	(6.80)	(−7.58)	(2.17)	(7.24)
MADRID	0.046**	−0.055	−0.018	0.028
	(2.45)	(−0.94)	(−0.49)	(1.15)
CENTRE	0.056**	−0.146**	0.009	0.081**
	(5.24)	(−4.57)	(0.44)	(5.24)
STUD2	−0.060**	0.102**	−0.055**	0.012
	(−6.24)	(3.68)	(−3.29)	(0.95)
STUD3	−0.071**	0.106**	−0.118**	0.083**
	(−5.18)	(2.55)	(−5.24)	(3.93)
		N = 6055		

Notes: ** Significant at the 5% level; * Significant at the 10% level.
The individual of reference is male, residing in the Mediterranean coastal region, who has completed EGB, BUP or FP-I. Heteroscedasticity robust. *t*-ratios in parentheses. Omitted category: inactives.

of being employed and a higher probability of being unemployed. An increase in the level of studies increases the probability of employment and decreases the probability of being unemployed with work experience.

The estimation of the probability of receiving unemployed benefits conditional upon being unemployed appears in Table 4, the dependent variable being dichotomous taking the value one if the individual is unemployed and receives relief, and zero when he/she does not. It can be observed that these probabilities do not vary significantly with the region of residence but do so with age and gender, being higher for older individuals and for women.

From the estimations of the income of each category and from the respective probabilities, the opportunity cost was calculated in accordance with Equation 14 for the sample of individuals who are secondary or university students or potential students. The next step is to aggregate this cost for all the potential students who are members of a single household, thus obtaining an estimate of the opportunity cost to a family that decides to invest in the education of all its potential students.

Estimation of expenditure on secondary and university education.

Table 5 shows the results obtained for the estimation of expenditure on secondary and university education. As for

the secondary education, results suggests that families who consider themselves to be of the upper class (*UPPER*) spend more on secondary education than those of middle class (*MIDDLE*), while the families classified as poor (*LOWER*) seem to spend less than those of middle class (although in this case the parameter is not significant at the standard levels of significance). With regard to the employment situation of the primary earner only those families in which the primary earner is unemployed (UNEMP) have an expenditure on education significantly lower than those in which he is employed (the reference category). It can be seen that families' expenditure on education depends to a large extent on the educational level of the primary earner, the expenditure being greater the higher the level of education of the decision-maker. There is also a substantial difference in the expenditure on secondary education between families living in big towns and cities (over 100 000 inhabitants- *SIZE3*-) and other families. Although the significance of the estimated parameter accompanying the variable that indicates if the primary earner is a skilled worker (*QUALIF*) cannot be accepted, there seems to be some evidence of a greater effort to educate the members of the family in that case. There is on the other hand no evidence of differences in this regard between families whose primary earner is a man and those where it is a woman (*GENDER*).

Table 4. *Logit estimation for the conditioned probability of receiving unemployment benefit*

Variable	Coefficient
CONST.	−3.089**
	(−4.53)
FEMALE	0.472**
	(3.09)
AGE	0.118**
	(3.95)
NORTH	0.010
	(0.04)
N-EAST	−0.215
	(−0.614)
ISLANDS	0.617*
	(1.793)
SOUTH	0.351
	(1.521)
MADRID	−0.593
	(−1.163)
CENTRE	0.182
	(0.740)
STUD2	−0.204
	(−0.894)
STUD3	−1.025**
	(−2.643)
	$N = 759$

Notes: ** Significant at the 5% level; * Significant at the 10% level.
The individual of reference is male, residing in the Mediterranean coastal region, who has completed EGB, BUP or FP-I. Heteroscedasticity robust. *t*-ratios in parentheses. Omitted category: does not receive benefit.

In regional terms, it seems that the effort to provide the members of the household with secondary education in all the regional groupings considered is lower than in the *EAST COAST* area, except in Madrid where per capita secondary education expenditure reaches the highest figures, controlling for the rest of the variables. The *NORTH EAST* and the *SOUTH* emerge as the regions where least effort is made in secondary education, once social and economic characteristics of the family have been controlled.

As was expected, the opportunity cost (OPC) has a significant and negative effect on the expenditure on secondary education. At these initial levels of non-compulsory education the opportunity cost is thus an important element in explaining investment in human capital, so the factors determining this cost, such as average wages and the unemployment rate, ultimately influence decisions on education at this stage.

To finalize the analysis of secondary education, it must be highlighted that the coefficient of the variable *NFEMALE* is not significant, indicating that the fact that there are in a family more males than females, or vice versa, who are in a position to enter secondary education does not influence the family decision on education expenditure.

Table 5. *Estimated coefficients of the Tobit specification for secondary and university education: relative opportunity cost*

Variable	Secondary	University
UPPER	14 646**	9785
	(2.29)	(1.10)
LOWER	−9 356	−21 886
	(−1.57)	(−1.54)
NCLASS	−3812	−16 620
	(−0.44)	(−0.92)
UNEMPL	−13 266**	−13 654
	(−2.09)	(−1.14)
PENSION	−531	−2377
	(−0.13)	(−0.37)
RENT	−8856	73 034*
	(−0.28)	(1.88)
INACT	−4 620	11 299
	(−0.44)	(0.78)
ILITER	−13 229**	−12 139*
	(−3.6)	(−1.65)
SECOND	14 672**	4727
	(3.71)	(0.80)
HIGH	20 065**	18 186**
	(4.33)	(2.71)
SIZE1	−17 495**	−5 465
	(−5.11)	(−0.87)
SIZE2	−13 965**	−9 114
	(−4.48)	(−1.64)
SIZE3	−16 477**	−2 637
	(−4.28)	(−0.41)
QUALIF	5006	5684
	(1.60)	(1.09)
GENDER	−3 135	−5638
	(−0.69)	(−0.82)
NORTH	−5 115	−12 119**
	(−1.50)	(−2.04)
N-EAST	−22 456**	−4 242
	(−4.63)	(−0.53)
ISLANDS	−16 648**	4692
	(−2.30)	(0.45)
SOUTH	−19 767**	−26 357**
	(−5.77)	(−4.15)
MADRID	12 459**	−1 914
	(2.11)	(−0.20)
CENTRE	−14 683**	−11 166*
	(−4.12)	(−1.81)
NEARNS	−8813**	−12 109**
	(−7.58)	(−6.05)
INCOME	0.0034**	0.0046**
	(4.03)	(3.36)
OPC	−27 497**	−9 913
	(−3.05)	(−1.09)
NFEMALE	−1 241	−8 039*
	(−0.49)	(−1.86)
	$N = 4496$	$N = 2231$

Notes: ** Significant at the 5% level; * Significant at the 10% level.
Sample: households with potential secondary and university students.

With regard to the coefficients estimated for per capita expenditure on university education appearing in Table 5, it seems that neither rich nor poor families make a significantly different effort of expenditure on university education from that made by middle class families. That is to say, once all the stages of the educational process leading to the threshold of university studies have been passed, families, whether upper, middle or lower class, make similar efforts in the education of their members. With regard to the employment situation, no significant differences appear between employed and unemployed. As to the level of education, only those households whose primary earner has completed university studies (*HIGH*) have a significantly higher per capital expenditure than those where the primary earner has only primary education. By regions, significant differences, implying a lower propensity to spend on university education, exist in the southern region of Spain and in the northern area.

The opportunity cost (OPC) does not seem to have a significant effect on expenditure on university education. Although the sign of the coefficient is as expected, it can not be accepted to be significant for the standard levels, so not allowing such clear cut conclusions as with secondary education. Perhaps in this case the greater employment opportunities and the expectation of higher earnings on graduation compensate for the flow of income not received because of the time devoted to studying.

To complete the analysis of expenditure on university education, the negative and significant coefficient of the variable (*NFEMALE*) must be highlighted, indicating that in those families where the number of women in a position to study at university is greater than the number of such men, the expenditure on education is also higher. This would seem to corroborate the general trend to massive incorporation of women into university education, explained to a large extent by the higher marks obtained in secondary education.

V. CONCLUSIONS

This study has analysed the factors that determine the expenditure in both secondary and university education by means of a Tobit specification in order to consider the case of zero expenditures. Among the explanatory variables we have included the opportunity cost incurred by a family who decides to invest in the education of all its members who are in a position to study. The expected income in different employment situations and the probabilities that an individual was in one each of these situations was estimated.

The results obtained for the labour market show clear discrimination against women aged between 16–26 years. Thus, women who find employment are seen to receive a significantly lower income. Furthermore, a woman seeking

employment would have approximately 20% less probability of finding it than a man. The probability that a woman will belong to the unemployed population is also greater than for men.

Age appears to be an important factor in determining expected income, both the average income expected in an employment situation, and the probability of remaining employed, increasing for older individuals. In the regional analysis there are evident signs of a comparatively worse situation for the workers of the regions in the South of Spain, the North area, the Centre and the Islands. This evidence extends to both the average income expected by a worker in any of these regions, and to the probability of finding employment. Finally, the positive influence of the level educational attainment on the determination of the expected income has to be highlighted.

The main results obtained in the analysis of expenditure on education confirm that the decision of investing in education is more influenced by social and economic characteristics of the household in the first years of non-compulsory education (secondary education) than in university education. It is in the first stage of non-compulsory education when the difference in educational effort between families with a different class perception and decision makers with different qualifications is more clear.

The influence of opportunity cost on education is negative for both secondary and university education, although only in the first case the coefficient of the variable is significant.

The analysis of the variable that measures the influence of the relative number of men in the family confirms the current Spanish trend to a greater incorporation of women into university education.

Finally, the analysis of regional influence on expenditure on education reveals lower effort in the more depressed regions that can reduce the speed of convergence among Spanish regions.

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APPENDIX

Selection of samples

For the analysis of secondary education those families with
members aged 14–20 years, with primary education (EGB)
completed and secondary education unfinished were
selected. This criterion provided a sample of households
with potential secondary students.

To study expenditure on the higher level of education, a
sample of families with members in a position to undertake
university studies was selected, which comprised those aged
18–26 years old, with COU or FP-II completed.

These selections were made on the basis of three criteria:

1. The minimum age for entry to each educational cycle
   (14 years for the secondary education cycle and 18 for
   the university cycle).
2. The organization of the Spanish education system,
   which requires completion of the upper cycle of
   EGB for access to the secondary cycle, and of COU
   or FP-II for access to the university cycle.
3. The age of finishing each educational cycle.

In the EPF each individual is asked if he/she considers
him/herself a student. Those who declare themselves to be
students are considered here as 'typical students' or full-
time students.

To examine the age at which typical students complete
their studies, the sample was examined, and it was decided
to determine the age of finishing the cycle on the basis of
the end of the age interval covering at least 95% of the
population that declared themselves to be secondary or
university students. According to this criterion, the age
range 14–20 years old was chosen for secondary students,
and 18–26 years old for university students. Logically, if
the age interval is widened, the coverage of the sample
increases. For example, if a range 14–21 years is considered
for secondary education, the percentage of individuals who
declare themselves to be secondary students would increase
to 96%, but the percentage of those who do not declare
themselves to be students even though they are studying
would increase even more (from 31.6% to 37.7%). Also,
although the secondary education cycle generally covers up
to 18 years old and university cycle until 23 years old, the
widening of the range to 20 and 26 years enables us also to
consider the majority of those who repeat some courses or
subjects.

For the estimation of the income that can be expected in
each employment situation (employed, EP, and unem-
ployed with work experience, UPE), which was used to
calculate the opportunity cost of Equation 14 a sample of
individuals aged 14–26 were selected, with EGB completed,
not doing military service and not classified as 'rentier'.

Definition of variables

Y_{EP_j} is the income received by the individual, when the jth
individual belongs to EP, constructed as the sum of the
income obtained through employment and the net income
obtained by self-employed work (gross income minus
deductible expenses).

Y_{UPE_j} is the income received by the individual belonging
to the active unemployed population with work experience,
and has been calculated as the sum per individual of unem-
ployment benefit, contributory invalid pensions, other con-
tributory pensions and other regular payments.

Z is the vector of personal characteristics formed by the
following variables:

AGE a continuous variable that takes values from 14 to
26 inclusive

FEMALE a dummy variable that takes value one when
the individual is a woman.

The eighteen Spanish Autonomous Communities have
been grouped into seven areas:

NORTH the North coast and mountains (País Vasco,
Cantabria, Asturias and Galicia)

EAST COAST the Mediterranean coast (Cataluña,
Comunidad Valenciana, and Murcia)

NORTH EAST Valley of Ebro (Aragon, Rioja and
Navarra)

ISLANDS Archipelagos (Baleares and Canazias)

SOUTH the South of Spain (Andalucia, Extremadura, Ceuta and Melilla)

MADRID Madrid

CENTRE Castilla-La Moncha and Castilla-León.

Three levels of education are distinguished:

STUD1 dummy variable taking the value 1 when the individuals of the sample have completed EGB or equivalent, BUP or FP-I.

STUD2 dummy variable taking the value 1 when the individuals of the sample have completed COU or FP-II.

STUD3 dummy variable taking the value 1 when the individuals of the sample have completed a university degree.

The *INCOME* variable contains the total flow of monetary and non-monetary income devoted to cover the family common expenses and obtained by all the income earners into the family.

The explanatory variables which we call environmental variables (*E*), are as follows:

The social class of the family, approximated by means of the following dummy variables:

UPPER dummy variable taking the value 1 when the family say they belong to the rich class or above the average.

MIDDLE dummy variable taking the value 1 when the family say they belong to the middle class or below the average.

LOWER dummy variable taking the value 1 when the family say they belong to the poor class.

NCLASS dummy variable taking the value 1 when the family does not respond or cannot classify itself in a social class.

The employment situation of the primary earner of the household, who plays the role of decision-maker with regard to the educational activities of the members of the family. This indicator is quantified through the following dummy variables:

EMPL dummy variable taking the value 1 when the primary earner is working.

UNEMPL dummy variable taking the value 1 when the primary earner is unemployed.

PENSION dummy variable taking the value 1 when the primary earner's income comes mainly from a pension.

RENT dummy variable taking the value 1 when the primary earner is classified as a 'rentier'.

INACT dummy variable taking the value 1 when the primary earner belongs to the remainder of the inactive population.

The educational level of the primary earner is quantified by the following variables:

ILITER dummy variable taking the value 1 when the primary earner is illiterate.

PRIM dummy variable taking the value 1 when the primary earner has completed primary studies, EGB or FP-I.

SECOND dummy variable taking the value 1 when the primary earner has completed BUP, COU or FP-II.

HIHG dummy variable taking the value 1 when the primary earner has a university first or higher degree.

The size of the town of residence, measured through the following dummy variables:

SIZE1 dummy variable taking the value 1 for towns of up to 10 000 inhabitants.

SIZE2 dummy variable taking the value 1 for towns of from 10 001 to 50 000 inhabitants.

SIZE3 dummy variable taking the value 1 for towns of from 50,001 to 100,000 inhabitants.

SIZE4 dummy variable taking the value 1 for towns of over 100 000 inhabitants.

The social and economic category of the primary earner, has been captured through the following variables:

QUALIF dummy variable taking the value 1 when the primary earner belongs to the category of entrepreneurs, professionals, or non-agricultural independent workers, professional managers or administrative heads.

NOQUALIF dummy variable taking the value 1 when the primary earner is unskilled or has not worked before, considering as unskilled white collar workers of low class or blue collar workers. This variable includes agricultural entrepreneurs and managers, members of agricultural co-operatives, service workers not included in the variable *QUALIF*, professionals of the Armed Forces, foremen, non-agricultural workers, members of non-agricultural co-operatives and other unclassifiable workers.

GENDER dummy variable taking the value 1 when the primary earner is a woman.

NEARNS number of ordinary income earners.

NFEMALE The number of males in relation to the number of females in a position to study at each level into the family. This attempts to verify whether in the decision to spend on education the proportion of men in the family is significant.

OPC opportunity cost incurred by the family, calculated aggregating Equation 14 for all the potential students in the family in each educational stage, and dividing by the family income.