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Adolescents' Time Use in Spain: Does the Parental Human Capital Matter?

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Abstract Adolescents' time use is an interesting topic for parents and policymakers. The concern arises because time allocation between productive and unproductive activities shapes the personality of children, which has important long-term consequences on their academic and employment success. Many studies conclude family environment affects how kids spend their time. The household type, the parents' characteristics and the family customs are related to the way children spend their time. An attractive issue is the effect of the parental education on the time use patterns of kids. The human capital acquired by the parents along with their relations with the family socioeconomic status, the social networks and the access to information constitute alternative scenarios that determine the activities of young people throughout the day and have an impact on their personal development and on their career. The primary objective of this paper is to analyse these topics for Spain, paying special attention to the influence of parents' education on children's time use. The empirical analysis use data from the Time Use Survey (INE). This dataset is suited for the purposes of this study since it uses a statistical measure called "time budget", which records the sequence and duration of activities conducted by a person over a period of 24 h and provides information about the personal characteristics of the household members. The specification and estimation of censored regression models is the methodology applied. The main results reveal that the adolescents' decisions about time allocation depend on their personal and family characteristics. In particular, parental education exerts a relevant influence on the participation and duration of productive or constructive activities, which is coherent with the predictions of the Ecological Systems Theory.

Keywords Time use · Children · Household characteristics · Censored regression models

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1 Introduction

Adolescents' time use is an important issue for parents and policymakers. The interest stems from the consensus about the influence of the time allocation between productive and unproductive activities on the academic and professional success, and on the social development. According to the field of the Developmental Psychology, in particular to the strand of the Constructivism Paradigm (e.g., Piaget 1970), the human development is characterised by the acquisition of knowledge over the life. This process can be individual or social and involves the investment of time and resources in a range of activities, which are considered as productive or constructive. In this way, the individuals acquire competences, skills and intellectual development that may be useful for them in their careers. Thus, for example, the Human Capital Theory (Becker 1964) postulates that the accumulation of human capital favours the wage growth and the upward occupational mobility. On the other hand, social development, good habits and qualities such as the empathy or the cooperation are fostered with the participation in social and cultural activities. These activities shape correctly the personality, prevent of risky behaviours, increase the social and cultural capital, and are channels to build confidence and proficiency (e.g., Mclanaham and Sandefur 1994).

In this setting, several theories highlight the relevance of how adolescents spend their daily time among different activities. The Ecological Systems Theory (Bronfenbrenner 1979) and the Social Control Theory (Berk 1993) are two of them. The first theory posits that personal development of children depend on their own natural endowments and on environmental factors such as family characteristics. The second theory argues that most people would have an inappropriate behaviour, if this one was not controlled by the society. Time displacement by participating in conventional activities (e.g., attending school), building commitment through the participation in constructive activities (e.g., reading a book) and familiar pressure would be three ways to avoid harmful children's time use patterns. Regarding familiar pressure, there is a general appreciation about parental control as a way of restraining wrong behaviours. For example, Zick et al. (2001) find that the involvement of parents with their children in activities such as reading or homework reduces the incidence of learning problems. On the other hand, the sociological literature has emphasised the relevant role of parental transmission on the social, educational and occupational achievements of children (e.g., Sewell and Hauser 1980). The parents' preferences about the time use of their children focus on activities with positive long-term consequences: study, sport and outdoor activities, social life and recreation, reading or helping with household chores (Dodson and Dickert 2004). In accordance with these arguments and with the results obtained in other studies, it is possible to suggest a taxonomy of some activities with positive or negative effects on the adolescents. In relation to the first group, individual activities such as "study" and "reading" improve the academic performance and the cognitive skills. Moreover, they represent a source of human capital that enhances the capacity to focus and the discipline (Zill et al. 1995). Second, the participation in the "household chores" and "family care" encourages personal traits like the responsibility or the maturity and develops the feeling of being part of a family (e.g., Aronson et al. 1996). Moreover, in the case of boys, it can be a mechanism to overcome the traditional division of domestic tasks at home (Alvarez and Miles 2012). Third, the activities associated with "social life and recreation" are a route to develop

interpersonal communication, sociability, peer relationships and personal well-being through the face-to-face social network (e.g., Wellman and Wortley 1990). Finally, "sport and outdoor activities" and "hobbies" allow children to learn abilities that are not acquired at schools, to promote values such as self-esteem or fellowship, to experience motivation and concentration, and to prevent risky behaviour such as drinking, vandalism, delinquency or smoking (e.g., Escabedo et al. 1993 or Larson 2000).

Concerning activities with negative influence, watching TV or using computer to play or chat may be considered harmful activities to the personal development of children. On the one hand, the time spent on watching TV is associated with lower cognitive test scores (Timmer et al. 1985) and is correlated negatively with the duration of the reading activities (Koolstra and Van Der Voort 1996). On the other hand, the excessive use of computer and its solitary nature can influence negatively on the social involvement and the psychological well-being (Kraut et al. 1998).

The primary objective of this research is to analyse how adolescents' time use patterns vary across social and demographic groups in Spain, paying special attention to the influence of the parental education on such time allocation. To the best of the author's knowledge, this type of analysis is unprecedented in the literature discussing Spain and has the advantage of using time-diary data from the 2009–2010 Time Use Survey (STUS). This survey conducted on behalf of the Spanish National Statistics Institute (INE) is nationwide representative and offers statistical information about the time allocation among different activities. The study focuses on the adolescents aged between 10 and 18 years, and the methodology applied consists in the specification and estimation of double hurdle models.

The remainder of the paper is organised as follows. Section 2 discusses some background literature. Section 3 describes the sample and the explanatory variables used in the estimates. Section 4 and 5 present the model and the empirical results, respectively. Finally, section 6 contains the concluding remarks.

2 Background

The literature discussing Spain has approached the links between fathers and children focusing mainly on the interrelations between parents' time use and child care. Some examples are the studies of Gutiérrez-Domenech (2010), Alvarez and Miles (2012) or Gracia (2014), which use data from the Spanish 2002–2003 Time Use Survey. Gutiérrez-Domenech (2010) concludes that parental education and labour market status are positively related to the time spent in childcare, since working parents with higher education spend more time with their children than non-working parents with less education. Alvarez and Miles (2012) find out that the types of gender roles between parents and children are positively correlated. For example, boys whose fathers do some domestic work devote more time to this type of tasks. Gracia (2014) obtains that the father's education has a significant effect on the physical care of children aged 0–5 years (for example, feeding, bathing or watching over). In addition, the fathers' physical care increases when the mother is employed.

On the contrary, studies on the interrelationships between family characteristics and children's time use are quite scarce in Spain. Moreover, they use data that are not nationwide statistically representative. For example, García-Continente et al. (2013)

shed empirical evidence about the association between overweight children and their habits of passive leisure (amount of time viewing television, playing videogames or using computer to chat or to surf the internet) with a sample of students from secondary schools in Barcelona. In particular, these authors find that the boys most prone to obesity live in one-parent families and use excessively media.

To the best of the author's knowledge, the literature discussing Spain has not shed empirical evidence on how parental education influences on the children' time use patterns, which is one of the main objectives of the current study. In relation to literature to other countries, this topic has been previously addressed from different perspectives and using diverse methodologies. First, it is possible to highlight some relevant studies such as Bianchi and Robinson (1997), Zick and Corinne (1996) or Gager et al. (1999), which were conducted to some states of the US. Bianchi and Robinson (1997), using time-diary data from a sample of California children, examine how family characteristics (including parental education) affect the amount of time spent by children in four activities: studying, reading, watching TV and doing household chores. These activities are considered relevant to modify the cognitive and social development of young people. These authors specify and estimate Tobit regression models and conclude that parental education is a predominant factor on the human and social capital investment received by children. Zick and Corinne (1996), using data from a sample of Utah households, assess how social capital along with other factors like the mother's education attainment affect the adolescents' time allocation among various productive activities (studying, paid work and household chores). Once again, the methodology applied is the one corresponding to the Tobit regression models. According to the parental education variables, they find a negative relationship between the mother's educational attainment and the time spent in housework. Gager et al. (1999) focus only on how children's household chores contributions depend on family characteristics. Their analysis is based on data from the Youth Development Study, that is a representative sample of Minnesota adolescent enrolled in the St. Paul public schools. Once applied multivariate regression models, they report that parental education exerts a negative effect on the children's contributions to housework.

A second group of articles is characterised for obtaining the data from nationwide representative samples. In this sense, it is worth mentioning the studies of Hofferth and Sandberg (2001), Porterfield and Winkler (2007), Kalenkoski and Sabrina (2009) or Mullan (2009). Hofferth and Sandberg (2001) examine how American children spend their time through the analysis of the information provided by the 1997 Child Development Supplement to the Panel Study of Income Dynamics, which contains a nationwide representative sample of young people in the US. The impact of family characteristics on the daily activities is measured like in Bianchi and Robinson (1997), that is, using Tobit regression models. These authors find that parental education is positively related to the time spent studying and reading, but negatively associated with watching TV. Porterfield and Winkler (2007) analyse the patterns and trends in American teen time use, drawing on data from three nationally representative surveys (the Current Population Survey, Monitoring the Future Survey and the American Time Use Survey). As a result, they report that highly educated parents exert more pressure on their children to focus them on college-oriented activities. Their conclusions are obtained using Ordinary Least Squares (OLS) technique on models with the conditional time spent in the activity as dependent variable. Kalenkoski and Sabrina (2009) select a

sample from the American Time Use Survey to examine the influence of employment status on the time use patterns of high school students. They estimate Tobit regression models, including parental education as a explanatory variable. Unlikely other studies mentioned above, they observe that parents' educational background affect positively on the time spent in homework. Finally, Mullan (2009) analyses the impact of maternal employment on how British young people allocate their time. This author tests its hypothesis estimating multivariate OLS regressions and controlling for parental education among other covariates. He finds that the process of time allocation shows significant differences depending if the mother works or not.

The methodology applied in the current article, specification of double hurdle models and subsequent estimation of their marginal effects, represents a contribution to the international literature that has approached the analysis of the adolescents' time use patterns. In particular, it allows us to differentiate the covariates' effects on the processes that determine the incidence and the duration of the daily activities. Moreover, it is worth mentioning that this study is the first analysis approaching this topic for the Spanish case.

3 Data

The empirical analysis employs data from the 2009–2010 STUS (INE 2011), which is a nationwide representative survey of households and individuals in Spain. The design of this survey meets the recommendations issued by the Statistical Office of the European Union (Eurostat) for Harmonised European Time Use Surveys, which ensures international comparability of the results. Some survey objectives are to contribute to the analysis of topics such as the implementation of family policies, the reconciliation of work and family life, the integration of socially excluded groups or the improvement of the living standards in the youth or in the elderly.

This survey measures the amount of time spent by the Spanish population on various activities, using a statistical measure called "time budget". The daily activities are recorded for each person (older than 10 years) according to their sequence and duration. The 24 hours are divided into 10 minutes intervals, and the respondents inform on the activities carried out in each one of them. The classification of the activities in 10 major subgroups is the following: personal care, paid work, study, household and family care, volunteer work and meetings, social life and recreation, sport and outdoor activities, hobbies and computer, media, travel and unspecified time. From this aggregate classification, we select other activities included in the major groups because they are interesting for our purposes. Specifically, study time is decomposed between time spent at school and free time allocated to study, the activity of social life and recreation is divided between active leisure (for example, going to the theatre) and passive leisure (for example, doing nothing), activity of hobbies and computer is partitioned between "hobbies" and "computer", and finally media activity has been separated between time spent reading and time allocated to watch TV or to listen radio. Hence, it is possible to observe time use's patterns in activities that are, a priori, less productive as, for example, watching TV.

The STUS population is composed of private households and persons over 10 years. Particularly, 19,295 individuals living in 9541 households answer the

questionnaire, which includes information about household and demographics characteristics. This study focuses on households with children aged between 10 and 18 years, and living with their parents (married-couple families or single-parent families). The lower bound of age range is 10 because the TUS provides only information about persons over 10 years living in private households, whereas the upper bound coincides with the age at which the adulthood is attained.

Table 1 displays the main descriptive statistics of the daily time spent on the activities classified by the STUS, which allows us to show an overall profile of adolescents' activity patterns. The most representative mean (average number of hours spent) corresponds to the activity "personal care" that aggregates the activities of "sleeping", "eating" and "unspecified care". In particular, it occupies the half of the hours a day, and is followed by "school" and "TV or radio" with 4 and 2 hours, respectively. On the other hand, the activities of "meeting" and "active leisure" have an average duration of more than an hour, whereas the time spent reading is practically residual.

Table 2 shows the descriptive statistics for the daily time use according to the parental education, which is measured as the educational attainment of the more educated parent. To get a more realistic view, the descriptive statistics are obtained for all individuals (including those who don't participate in the activity) and, only, for individuals who do engage in the activity.

The results show that the activity "watching TV or listening radio" has the highest incidence, mainly for individuals living with fathers whose studies are lesser than upper secondary education (with a percentage of participation around

Table 1 Daily hours that adolescents spend doing various activities		

Main activity	Mean	Std. Dev.
Personal care	12.20	2.11
Paid-employment	0.09	0.74
School	3.64	3.61
Study	0.16	0.59
Household and family care	0.70	1.04
Meeting	1.48	2.11
Active leisure	1.15	1.88
Passive leisure	0.23	0.79
Sport and outdoor activities	0.90	1.43
Hobbies	0.10	0.16
Computer	0.07	0.11
Reading	0.01	0.04
TV or Radio	1.85	1.69
Travel and unspecified time	1.09	0.94
Total time	24	
Number of observations	1485	

Source: Own elaboration from data of the Time Use Survey 2009–2010 (INE 2011)

Table 2 Daily hours that children spend doing various activities according to parental education

Main activity	Less than upper secondary education		Upper secondary education[a]		Higher education[b]	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Personal care						
Unconditional mean	12.33	2.15	11.93	1.85	12.23	2.20
Conditional mean	12.33	2.15	11.93	1.85	12.23	2.20
% with zero hours	0		0		0	
Paid work						
Unconditional mean	0.17	1.04	0.03	0.35	0.04	0.54
Conditional mean	4.82	2.79	3.77	0.63	5.60	2.25
% with zero hours	96.39		99.13		99.15	
School						
Unconditional mean	3.21	3.49	5.68	3.01	3.67	3.65
Conditional mean	5.42	2.93	5.79	3.02	5.70	3.01
% with zero hours	40.79		26.09		35.67	
Study						
Unconditional mean	0.12	0.59	0.19	0.64	0.17	0.56
Conditional mean	1.85	1.42	1.66	1.07	1.54	0.84
% with zero hours	93.14		88.41		88.57	
Household and family care						
Unconditional mean	0.76	1.10	0.70	0.97	0.64	1.03
Conditional mean	1.31	1.17	1.15	1.01	1.02	1.15
% with zero hours	41.88		38.84		37.20	
Meetings						
Unconditional mean	1.49	2.15	1.39	1.87	1.53	2.21
Conditional mean	2.51	2.29	2.14	1.95	2.47	2.36
% with zero hours	40.79		35.07		38.23	
Active leisure						
Unconditional mean	1.12	1.82	1.10	1.72	0.92	1.68
Conditional mean	2.27	2.03	2.09	1.89	1.91	2.00
% with zero hours	50.36		47.25		47.44	
Passive leisure						
Unconditional mean	0.21	0.68	0.22	0.78	0.25	0.89
Conditional mean	1.22	1.20	1.17	1.46	1.31	1.67
% with zero hours	82.67		80.87		80.72	
Sport and outdoor activities						
Unconditional mean	0.91	1.30	0.78	1.35	0.96	1.59
Conditional mean	2.01	1.23	2.02	1.49	2.25	1.74
% with zero hours	54.69		61.45		57.00	
Hobbies						
Unconditional mean	0.12	0.16	0.09	0.17	0.10	0.17
Conditional mean	0.23	0.16	0.22	0.20	0.22	0.19

Table 2 (continued)

Main activity	Less than upper secondary education		Upper secondary education[a]		Higher education[b]	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
% with zero hours	55.78		58.26		51.19	
Computer						
Unconditional mean	0.07	0.11	0.07	0.12	0.05	0.10
Conditional mean	0.17	0.11	0.18	0.14	0.15	0.12
% with zero hours	59.39		58.84		56.83	
Media: Reading						
Unconditional mean	0.01	0.03	0.01	0.03	0.02	0.04
Conditional mean	0.09	0.06	0.07	0.05	0.08	0.06
% with zero hours	88.09		85.22		76.28	
Media: TV or Radio						
Unconditional mean	2.19	1.82	1.76	1.61	1.56	1.54
Conditional mean	2.56	1.71	2.15	1.52	1.96	1.48
% with zero hours	14.26		18.26		20.31	
Travel and unspecified time						
Unconditional mean	1.01	0.90	1.05	0.86	1.17	1.01
Conditional mean	1.20	0.86	1.22	0.81	1.36	0.96
% with zero hours	15.52		13.62		14.33	
N° Observations	554		345		586	

[a] This category includes individuals with medium level vocational and technical training

[b] The educational level of higher education is composed of upper level vocational and technical training, short-cycle higher education and long-cycle higher education

Source: Own elaboration from data of the Time Use Survey 2009–2010 (INE 2011)

86 %). The time spent by this group of individuals watching TV or listening radio is about 2.5 hours (half hour more than children living with parents with higher education). Excluding "travel and unspecified time", "school" and "meetings" are the next activities with the highest percentages of participation. For example kids, whose fathers have "upper secondary education", have an incidence in these activities around 74 % and 65 %, respectively. Another interesting result is that children with highly educated parents (higher education) have the highest incidence in "reading" (a participation rate of 24 %).

The previous comparisons are done activity-by-activity. To achieve a measure more informative of the differences by groups of children, it is necessary to obtain a dissimilarity index that sums up the divergences in the "activity profiles". In this way, it is possible to evaluate how overall time use differs according to the parental education. The measure used is the weighted absolute deviation index (Stewart 2006) that supposes that the weights are equal to the fraction of total time spent in each activity:

$$DI = \sum_{i=1}^{k} \left\{ \frac{|a_i - b_i|}{a_i + b_i} \left(\frac{a_i + b_i}{\displaystyle\sum_{i=1}^{k} (a_i + b_i)} \right) \right\} \tag{1}$$

a_i and b_i are the times spent in activity i by the groups a and b, respectively, and k is the number of activities. This index ranges between 0 and 1, the value 0 means that both groups of children (differenced according to the parental education) spend the same amount of time in each activity, whereas the value 1 implies that both collectives do not have activities in common. A relevant and desirable property of this index is its insensitivity to the level of aggregation of the activities. Table 3 presents the values obtained of the weighted absolute deviation index, all of them are different from zero which indicates divergences in the adolescents' time allocation according to the parental education. In particular, the highest value corresponds to the comparison between the two lowest levels of education.

The difference according the time use patterns are also controlled in the estimates by other personal characteristics such as gender, age, geographic origin, main activity status of the father and mother, type of family (two-parent or one-parent), current Spanish region of residence and municipality size. The descriptive statistics for these variables appear in the table 4. In relation to the personal characteristics, first, it is observed that the proportion of men is slightly higher than women (53 % versus 47 %). Second, the average age of the adolescents in the sample is 14 years. Regarding the geographic origin, 88 % of individuals are Spanish, and most of foreign adolescents (9 %) were born in non-European Union countries. With respect to the household characteristics, 86 % of households are composed by two parents and in 38 % of them both father and mother are employed. In addition, the highest educational attainment of the more educated parent is lesser than higher education in 62 % of the cases. Finally, the most representative individual in the sample resides in the South region (26 %) and in municipalities with more than 100,000 inhabitants (80 %).

Table 3 Dissimilarity index according to parental education

Parental education	Children aged 10–18 years
Less than upper second education versus upper second education	0.08
Less than upper second education versus higher education	0.04
Upper second education versus higher education.	0.07

Source: Own elaboration from data of the Time Use Survey 2009–2010 (INE 2011)

Table 4 Descriptive statistics of the variables used in the estimates

Variables	Children aged 10–18 years	
Gender	Mean	Std. Dev
Male	0.53	0.50
Female	0.47	0.50
Age	14.03	2.57
Geographic origin		
Spain	0.88	0.32
UE	0.03	0.13
Not UE	0.09	0.29
Parental education		
Less than upper secondary education	0.38	0.46
Upper secondary education[a]	0.23	0.42
Higher education[b]	0.39	0.48
Type of family		
One-parent family	0.14	0.35
Two-parent family	0.86	0.35
Main activity status of father and mother		
Father only employed	0.27	0.44
Mother only employed	0.17	0.37
Both father and mother employed	0.38	0.48
Father and mother not employed	0.18	0.35
Current Spanish region of residence		
Center	0.15	0.36
East	0.17	0.37
Madrid	0.13	0.33
Northeast	0.18	0.38
Northwest	0.11	0.32
South	0.26	0.40
Municipality size		
Less than 10,000 inhabitants	0.20	0.40
More than 10,000 inhabitants	0.80	0.40
Number of observations	1485	

[a] This category includes individuals with medium level vocational and technical training

[b] The educational level of higher education is composed of upper level vocational and technical training, short-cycle higher education and long-cycle higher education

Source: Own elaboration from data of Time Use Survey (INE 2011)

4 Method

This section is dedicated to the specification of an econometric model that analyses whether the differences in the children' time use, observed in the descriptive analysis,

remain once controlled the rest of personal and household characteristics. When time-data are used in the regression analysis, a significant proportion of individuals report zero minutes for many activities. This occurs for all the activities analysed in this paper, except for "personal care". Traditionally, the literature has used the Tobit model for taking account such censoring. The main restriction of this methodology is to assume that the participation and the time spent in the activity have the same underlying process (that is, they have the same parameters). This restrictive assumption can be overcome if a double-hurdle model is applied (Cragg 1971), where two separate hurdles must be passed before observing a positive value for the time spent in the activity. The first hurdle is specified through the latent variable y_i^*, which represents the unobserved propensity to participate in an activity and is modelled as:

$$y_i^* = x_{1i}'\gamma + \varepsilon_{1i} \tag{2}$$

The individual participates in the activity if $y_i^* > 0$. The second hurdle concerns the level of time spent in the activity, y_i (given that $y_i^* > 0$), which is supposed following a normal truncated regression model:

$$E\left(y_i \middle| y_i^* > 0, x_{2i}\right) = x_{2i}'\beta + E\left(\varepsilon_{2i} \middle| y_i^* > 0, x_{2i}\right) \tag{3}$$

X_{1i} and X_{2i} are vectors of explanatory variables: gender, age, geographic origin, type of family parental education, main activity status of the father and mother, current Spanish region of residence and municipality size. γ and β are vectors of unknown coefficients.

The double hurdle model is estimated using the maximum likelihood estimation procedure and its log-likelihood function is:

$$L = \prod_{i=1}^{N} \left[1 - \Phi\left(x_{1i}'\gamma\right)\right]^{1[y_i=0]} * \left[\Phi\left(x_{1i}'\gamma\right)\frac{1}{\sqrt{2\pi}\sigma}\exp\left\{-\left(y-x_{2i}'\beta\right)^2/2\sigma^2\right\}/\Phi\left(x_{2i}'\beta/\sigma\right)\right]^{1[y_i>0]} \tag{4}$$

where Φ is the cumulative distribution function of the normal distribution, 1[.] is an indicator function equals to unity whenever the statement in brackets is true, and zero otherwise.

The first term of equation 4 corresponds to the contributions of all observations with zero minutes of participation in the activity. The second term accounts for the contribution of all the observations with non-zero minutes. Through the estimated coefficients of the double-hurdle model, it is possible to obtain the marginal effects and measure accurately the influence of the regressors on the incidence and time spent on each activity. For a given observation, the marginal effect of an independent variable x_j around the probability that $y_i^* > 0$ is:

$$\frac{\partial P\left(y_i^* > 0 \middle| x_{1i}\right)}{\partial x_{j,i}} = \gamma_j \phi\left(x_{1i}'\gamma\right) \tag{5}$$

where γ_j is the coefficient on X_j in equation (2). On other hand, the partial effect of X_j on the expected value of y_i, given $y_i^* > 0$ is:

$$\frac{\partial E\left(y_i|y_i^* > 0, x_{2i}\right)}{\partial x_{j,i}} = \beta_j\left[1 - \lambda\left(x_{2i}'\beta/\sigma\right)\left\{x_{2i}'\beta/\sigma + \lambda\left(x_{2i}'\beta/\sigma\right)\right\}\right] \qquad (6)$$

where β_j is the coefficient on x_j in equation (3).

For dummy explanatory variables, the marginal effects are obtained as changes in the dependent variable when the dummy variable is shifted from zero to one:

$$P\left(y_i^* > 0|x_{1i}, x_{ji} = 1\right) - P\left(y_i^* > 0|x_{1i}, x_{ji} = 0\right) \qquad (7)$$

$$E\left(y_i|y_i^* > 0, x_{2i}, x_{ji} = 1\right) - E\left(y_i|y_i^* > 0, x_{2i}, x_{ji} = 0\right) \qquad (8)$$

Once the marginal effects are calculated for all individuals, the average partial effect is obtained for each independent variable (Burke 2009).

The double hurdle-model is estimated separately for each activity, excluding "personal care", "paid work", "school" and "passive leisure". "Personal care" is not considered because its percentage of participation is 100 %, and, moreover, this category has less interest for the purposes of this study, since it is composed by the activities "sleeping", "eating" and "unspecified personal care". "Paid work" is also excluded from the analysis because the sample contains individuals aged 10–18 years and, as a consequence, most of them can not participate in this activity as the legal age to work in Spain is 16 years. The time spent at school is excluded from the analysis, since it depends on the trimester where the individual is observed, and therefore the initial sample would require an additional selection that would decrease significantly the number of observations. Unfortunately, the incidence and time spent in "passive leisure" is not modelled because the 2009–2010 STUS includes, in this category, activities so diverse as doing nothing or thinking about a problem.

5 Results

The estimates of the marginal effects corresponding to the incidence of each activity are reported in table 5. The results show the existence of gender roles in the children's time allocation, since the gender is a relevant variable to explain the incidence of all activities, with the exception of the activity "watching TV or listening radio" where there are no differences between men and women. The activities "study", "household and family tasks", "meeting", "active leisure", "computer" and "reading" are more likely for women than for men. For example, girls have a probability of participating in "household and family tasks" 16 percentage points higher than men. On the other hand, men take part in the activities "sport" and "hobbies" more than women, with a positive difference of 8 and 14 percentage points, respectively. Secondly, age is a relevant variable but the sign of its marginal effect is not homogenous among activities. Indeed,

Table 5 Marginal effects of the first hurdle: Participation[a,b]

Regressors	Study	Household and family care	Meeting	Active leisure	Sport	Hobbies	Computer	Reading	TV or Radio
Gender									
Male	-0.019*	-0.163***	-0.051**	-0.052**	0.083***	0.139***	-0.049**	-0.044**	-0.010
Age	-0.001	0.006^	0.029***	0.034***	0.001	-0.050***	0.049***	-0.008***	-0.020***
Geographic origin									
UE	-0.063***	-0.037	0.065	0.098*	-0.132	-0.048	0.071	0.041	-0.223***
Not UE	0.009	-0.013	-0.020	-0.066**	-0.052^	-0.086**	0.044	-0.027	-0.010
Type of family									
One-parent family	-0.001	0.012	0.002	0.007	0.017	-0.012	0.002	-0.005	-0.006
Parental education									
Upper secondary education	0.037**	0.023	0.029	0.025	-0.077**	-0.016	-0.019	0.004	-0.046*
Higher education	0.030**	0.031	0.048**	0.035	-0.038	0.021	0.004	0.069**	-0.085**
Activity status									
Father only employed	0.042**	-0.006	-0.019*	0.035	0.101**	-0.017	0.170**	0.031*	-0.047
Mother only employed	0.058**	-0.001	0.022	0.065**	0.032	-0.040	0.140**	0.022	0.007
Both fath. and moth. employed	0.056	0.020	-0.003	0.035	0.040	-0.014	0.146***	0.054**	0.016
Spanish region									
Northwest	-0.030*	-0.016	-0.063*	-0.067^	0.021	0.013	0.047**	0.088**	-0.118**
Northeast	-0.019	0.014	0.021	0.015	0.012	-0.013	-0.025	0.029	-0.049*
Madrid	-0.074**	0.008	-0.051	-0.027	0.019	-0.006	-0.007	0.095**	-0.108**
Center	0.010	-0.050**	-0.014	-0.018*	-0.042	-0.017	0.005	0.060**	-0.034
East	-0.026	0.035	-0.056^	-0.016*	-0.042*	-0.60**	0.022	0.019	-0.048
Municipality size (inh.)									
Less than 10,000	-0.030**	0.033	0.060**	0.038	-0.098***	-0.011	-0.012	-0.027**	-0.081*
Number of observations	1485								

it has a positive influence on the participation in "active leisure", "meeting" and "computer", but negative on the participation in "hobbies","reading" and "watching TV" or "listening radio". In particular, the highest positive marginal effect corresponds to the activity "computer" (one more year increases the incidence of this activity in 3 percentage points), whereas the least effect is for "hobbies" (one more year decreases the participation in 5 percentage points). With respect to the geographic origin, the highest difference among groups of adolescents is to the activity "watching TV or listening radio", since kids from the UE countries have a probability of participating in this activity that is 22 percentage points lesser than the corresponding one to the rest of young people. As regard family characteristics, the results are coherent with the predictions of the Ecological Systems Theory (Bronfenbrenner 1979) since the adolescents' time use patterns are influenced by other member of the household. First, parental education is positively related to the participation in productive activities such as "study", "meeting" and "reading", and negatively associated with the incidence of the activity "watching TV or listening radio", which is less important for the development of the adolescents than those mentioned above. Higher parental education is the explanatory variable showing the greatest marginal effects, in particular, adolescents with highly educated parents have a probability of participating in "reading" 7 percentage points higher than adolescents whose parents have the lowest educational level (low upper secondary education), while their probability of "watching TV or listening radio" is lesser in 8.5 points. These facts are coherent with the strand of the Human Capital Theory that emphasises the existence of positive externalities and social returns of the education beyond the benefits associated with the productive process and the professional success (Lange and Topel 2006). In this case, the positive effects of the education come from the intergenerational transmission between parents and children. Parents can encourage their children to participate in skill-building activities and, moreover, children can tend to emulate the parents' behaviour (Zill and Nord 1994).

Concerning the labour market status of the adolescent's father and mother, first, it is noteworthy that it is used as a proxy of the household's socioeconomic level since the variable household income has missing values in more than 25 % of the questionnaires of the 2009–2010 STUS. This can explain some of the results obtained that are associated with the financial capacity of the family, for example, adolescents whose both parents are employed have a probability of using computer 14.6 points higher than the corresponding to those with both parents unemployed. Moreover, for the activity "reading", the difference of probability is of 5.4 percentage points in favour of the first group of kids.

Regarding the place of residence, first, adolescents from municipalities with less than 10,000 inhabitants participate more in the activities of "study", "sport", "reading" or "watching TV" and less in "meeting" than the rest of young people. Second, adolescents from Madrid or Northwest region have more probability of engaging in the activity of "reading" (around 9 percentage points) than those living in the South region.

The marginal effects of the regressors on the conditional expected duration of each activity are displayed in table 6. Again, the behaviour of the adolescents is not homogenous according to their personal and family characteristics. First, boys spend less time in the activity "household and family care" than girls, but they spend more time in the activity "meeting", "hobbies" and "sport". With

Table 6 Marginal effects of the double hurdle models: Conditional expected duration[a,b]

Regressors	Study	Household and family care	Meeting	Active leisure	Sport	Hobbies	Computer	Reading	TV or Radio
Gender									
Male	0.237	-0.334***	0.224^	0.170	0.173*	0.032**	-0.012	-0.003	0.036
Age	0.087*	0.022	0.218***	0.244***	0.037^	-0.008***	0.011***	0.003***	0.006
Geographic origin									
UE	-0.240	0.516	1.084^	1.294	-0.263	0.015	0.051	0.057	0.616**
Not UE	0.118	0.099	-0.653**	-0.557*	-0.170	-0.022*	0.008	0.005	0.329***
Type of family									
One-parent family	0.588^	-0.028	-0.480**	-0.454**	0.209	0.020	-0.030*	-0.001	0.186^
Parental education									
Upper secondary education	-0.279**	-0.130	-0.531**	-0.360*	-0.014	0.008	0.032*	-0.013^	-0.359**
Higher education	-0.442***	-0.167	0.136	0.145	0.236**	-0.001	-0.003	0.004	-0.491***
Activity status									
Father only employed	0.623**	-0.272*	-0.309	-0.098	-0.020	0.017**	-0.027	0.008	-0.195
Mother only employed	0.929**	-0.017	0.414	0.539	0.006	0.009	-0.075**	-0.008	-0.156
Both fath. and moth. employed	1.094***	-0.260	-0.533	-0.228	-0.070	0.026	-0.062^	0.002	-0.304**
Spanish region									
Northwest	-0.166	-0.293***	0.144	0.481	0.025	-0.009	-0.002	0.012	0.226^
Northeast	-0.283	-0.380**	0.624**	0.894**	-0.121	0.003	-0.026	0.011	-0.109
Madrid	-0.410	-0.004	0.820**	0.821**	0.210^	-0.015	-0.004	0.009	0.113
Center	0.067	-0.006	0.636**	1.024***	-0.044	0.003	-0.010	0.021**	-0.091
East	-0.029	-0.240*	0.128	0.362	0.218	-0.009	0.006	0.030**	0.087
Municipality size (inh.)									
Less than 10,000	0.006	-0.043	0.583*	0.332	-0.224*	0.002	-0.013	-0.001	-0.063
Number of observations	1485								

(a) The reference is an Spanish woman, living in a municipality with more than 10,000 inhabitants of the region South, and whose parents have an educational level less than upper secondary and are not employed

(b) (***) Significant at 1 %, (**) at 5 %, (*) at 10 %, (^) at 15 %

Source: Own elaboration from data of the Time Use Survey 2009–2010 (INE 2011)

respect to the geographic origin, the activities of "meeting", "active leisure" and "hobbies" have less duration for people from not UE countries than for the rest, whereas Spanish adolescents is the group spending less time watching TV or listening radio (for example, about 36 minutes less than adolescents from the UE countries). On the other hand, the type of family (one-parent or two-parent family) is a relevant variable to explain the duration of the different activities. In particular, children from one-parent families spend less time in "meeting", "active leisure" and "computer" than kids from two-parent families, whereas the opposite occurs to the activities of "study" and "watching TV or listening radio". Regarding the effects on parental education, it is observed that children with highly educated parents spend less time watching television, which is coherent with the predictions of the literature (see, for example, Bianchi and Robinson 1997 or Hofferth and Sandberg 2001). Second, the time of study out the school is correlated negatively with the parental education. The help of parents to their children in the activity of "study" may increase with their educational level. Therefore, adolescents with highly educated parents may need less time to do their homework. Another relevant conclusion is that parental education influences positively on the episodes of reading but does not increase the time spent on such activity. With respect to the area of residence, it is observed that children living in municipalities with less than 10,000 inhabitants have episodes of "meeting" longer than the rest of adolescents. Finally, kids living in the Center, Northeast or Madrid spend more time in the activities of "meeting" or "active leisure" than those residing in the rest of Spanish regions.

6 Conclusion

This article has addressed the influence and the social impact of education from a different perspective to the adopted traditionally by the literature. In particular, the primary objective of this study has been to analyse if the parental education influences on how the adolescents (aged between 10 and 18 years old) spend their time among different activities. In this way, the main hypothesis verified is that the educational attainment benefits not only the current generation but also their descendants. This study expands the knowledge of this issue for the Spanish case, since this type of analysis is unprecedented in the literature discussing Spain. In addition, it provides a methodological contribution to the international literature analysing the adolescents' time use. Specifically, the processes determining the participation and the duration of a particular activity have been differenced through the specification and estimation of double hurdle models.

The empirical strategy has been to use data from the STUS 2009–2010 (INE 2011) that informs about the daily time allocation and to identify the activities that can influence positively on the optimal personal and social development of the adolescents, and on their academic and professional success. In this way, time use is thought as a start point to examine the links between experiences and positive outcomes. Previous research about this topic in the economic, psychological and sociological literature have been the background used to select such activities ("study", "reading", "household chores", "family care", "sport and outdoors activities" and "hobbies").

The findings of this article as a whole reveal that the structure of time allocation among activities is a process that depends on the personal and family characteristics. Therefore, the probability of engaging in productive activities and its duration is not homogenous among subgroups of adolescents. This fact implies that the adolescents' time use patterns can be an initial source of exclusion or social inequality with long-term consequences on their development and career. Being conscious that this topic needs more complex inquiry, the results of this study shed empirical evidence and contribute to the debate about how to improve the efficiency of the adolescents' time use.

Focusing on the primary objective of this paper, the results support the benefits of human capital on the society and are coherent with the postulated of the Ecological Systems Theory (Bronfenbrenner 1979). Thus, parental education increases the participation and duration of some activities that have positive effects on children, and decreases them in other activities with harmful influence. For example, parental education is positively associated with the participation in activities such as "study", "meeting" and "reading", and negatively related to the incidence of the activity "watching TV or listening radio". This result is an example that the intergenerational transmission between parents and children goes beyond economic aspects such as the income or the social status. Second, the findings indicate the existence of gender roles according to the probability of engaging in activities and its duration. This is specially remarkable for the activity "household and family tasks", which can mean that adolescents can be reproducing the gender role division of their parents. An interesting inquiry would be to analyse if the gender segregation according time use is observed later when they raise a family. This kind of research would require the elaboration of a survey that allows panel data analysis about time use. Third, the results about the geographic origin note that the cultural and social assimilation of foreign adolescents to the Spanish is not fully achieved. They show significant differences according to their time use patterns, which are more strong to immigrant from non-European Union countries. This last result is expected since most of these adolescents come from countries with less economic development than Spain.

Concerning other family characteristics, it has been verified that the type of family and the activity status are also relevant variables, which confirms the importance of the family background and the economic environment on the adolescents' time use. For example, the duration of the activity "watching TV" is higher for those adolescents whose both parents are unemployed. In some way, this result links the economic progress with aspects related to the development of adolescents. Finally, the results associated with the regional dummy variables indicate the presence of specific peculiarities related to the area of residence, which are influencing the decisions about the adolescents' time use. These regional peculiarities can represent unobservable factors, difference in the cultural development of the regions or climate factors.

In sum, these findings have showed that adolescents' time allocation between productive and unproductive activities is not homogenous, since there are time use patterns clearly defined according to the personal and family characteristics. Therefore, fathers and policymakers have room for manoeuvre to improve the present and future well-being of adolescents in Spain.

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