# Effects of parents' education on children's time use in Spain

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Children's time use is of great interest for both parents and policy makers. The concern is because allocation of time by the young people between productive and unproductive activities, their social patterns and their habits of active and passive leisure shapes their personality and has important long-term consequences on their academic and employment success. Many economic studies have reported on how the family environment affects how young people spend their time. The household type, the parents' characteristics and family customs are related with the way in which young people spend their time. An interesting issue in this context is how the parental education affects the time-use patterns of children. The time use's patterns associated with the human capital acquired by the parents along with their relations with the family's 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 economic impact in the future. The main objective of this paper is to analyse these topics for Spain, paying special attention to the effects of parents' education on children's time use. The empirical analysis use data from Time Use Survey (INE). This dataset is suited for the purpose of this study since it uses a statistical measure called "time budget" that 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 will be the methodology applied.

## INTRODUCTION

Children's time use is of great concern for both parents and policy makers. The interest comes from the existing agreement about the importance of the allocation of the time by the young people between productive and unproductive activities on their academic and employment

success. The social patterns and the good habits shape the children' personality and are relevant instruments that facilitate the child development and the path between childhood and adulthood. Following this line, several theories argue why time use of adolescents is important. Two of them are the Ecological Systems Theory (Bronfenbrenner, 1979) and the Social Control Theory (Berk, 1993). The first theory posits that young person's development depends on its own natural endowment and on environmental factors such as parent's characteristics. The second theory argues that without restraining forces most people would engage in some inappropriate behaviour by society. So, there are three ways in which adolescent's time use patterns might affect their chances of avoiding risky behaviour: time displacement by participating in conventional activities (for example, attending school), commitment building that is participation in constructive activities (for example, reading a book) and familiar pressure. As regard the last point, there is a general recognition that the children's time use's control by parents is a way of restraining wrong behaviours. For example, Zick *et al.* (2001) find that the involvement of parents in activities such as reading or homework with their children decreases learning problems. In general, parents try to influence the children's time allocation because they assume that how children spend their time matters for their future achievement. Parent's preferences about their children' time use include study, sport and outdoor activities, social life and recreation, reading or helping with household chores as recommended activities that have positive long-term consequences (Dodson and Dickert, 2004).

On the other hand, activities such as the passive leisure, watching TV[1], or chating may be considered harmful activities to the personal development of children. With respect to activities related with the paid employment, the economic literature obtains different conclusions about its influence on children' future achievement. First, paid-employment can lead to the development of important skills as, for example, responsibility or mechanism to interact with others (Hofferth and Sandberg, 2001). Second, time spent on work is competing with time spent on the learning and acquisition of academic skills (Zill *et* al.1995). Moreover, early start of working life can cause some disorder associated with stress or anxiety.

Some studies of the Spanish sociological and economic literature have approached to the interrelations between parents' time and child care, using the Spanish Time Use Survey 2002-2003 (INE), for example, it can be referenced the works of Gutierrez-Domenech (2010), Alvarez and Milles (2011) or Gracia (2014). Gutierrez-Domenech (2010) concludes that parental education is a crucial factor related positively with the time spent in childcare, in particular, working parents with higher education spend more time with their children than non-working parents with lower education. Alvarez and Milles (2011) find out that a weak parent's adherence to traditional gender norms contributes to reducing the traditional gender roles in childhood. Particularly, boys whose father do female-typed domestic work devote more time to these tasks. Gracia (2014) analyses how father's child care differ by children's age and its effect on gender equity, the main empirical results obtained are that the father's education has a significant effect on physical care of children aged 0-5 years (for example, feeding, bathing or watching over), and mother's employment has a positive effect on fathers' physical care when the activities are important for gender equality in the household. From a different perspective, the analysis on the influence of family characteristics on children' time use are quite scarce in

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[1] Watching TV has been associated to lower cognitive test scores (Timmer *et al.*, 1985) and with less time in activities such as reading (Koolstra and Van Der Voort, 1996).

Spain, and the existing studies focus on samples that are not statistically representative nationwide. For example, García-Continente *et al*. (2013) use a sample of student from secondary schools in Barcelona to shed empirical evidence about the association between the children' habits of passive leisure (amount of time viewing television, playing videogames or using computer to chat or to surf the internet) and the overweight of children and adolescents, finding that boys who live with both father and mother are less likely to use media excessively than children living with single-mother or single-father.

The main objective of this research is to analyse how young people time use patterns vary across social and demographic groups in Spain. In particular, it is analysed how children from fathers of different educational backgrounds divide their time among activities along the day. In this way, we will approach the children's time allocation between productive and unproductive activities. This analysis is carried out by distinguishing between two subgroups: children aged between 10 and 15 years, and those aged 16 and 24 years. These age ranges correspond to the definitions of puberty and youth made by the United Nations Organizations at the time of the International Year of Youth in 1985. As far as we know, this type of study is unprecedented in the economic literature discussing Spain and has the advantage of using time-diary data from the Spanish Time Use Survey (STUS) 2009-2010, which a nationally representative survey, conducted on behalf of the Spanish National Statistics Institute (INE). This survey is a source of statistical information comparable to the existing ones for other countries of the European Union and it is suitable for this study providing information about the allocation of time by individual between different activities.

The remainder of the paper is organized as follows. Section 2 describes the samples and the explanatory variables used in the estimates. Section 3 presents the model and the econometric specifications. Empirical results are discussed in section 4. Finally, section 5 contains the concluding remarks.

## DATA

The empirical analysis employs data from the STUS 2009-2010 (INE,2011), a representative survey of households and individuals in Spain. This survey measures the amount of time spent by the Spain population on various activities, using a statistical measure called "time budget". This daily of time records the sequence and duration of activities conducted by a person (older than ten years) over a period of 24 h (from 6 am until 6 am the next day). The 24 hours are divided into ten minutes intervals, and the respondents inform on the activities carried out in each 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 obtain other activities included in the major groups that are interesting for this analysis. So, the study time is decomposed between compulsory (time spent at school) and voluntary (free time allocate to the study), the activity of "social life and recreation" is divided between active leisure (for example, going to the theatre) and passive leisure (for example, being bored), "hobbies and computer" activity is partitioned between "hobbies" and "computer", and finally "media" activity has been divided between time spent reading and time allocated to watch TV or listen radio. In this way, it is

possible to observe time use's pattern in activities that are, a priori, unproductive as, for example, passive leisure, watching TV or listening radio.

The STUS population consists of all private households and all persons over 10 years living in them. In particular, 19,295 individuals living in 9,541 households are required to answer the questionnaires which includes information about household and demographics characteristics. This study focus on those households where there are children living with their parents (married-couple families or single-parent families). As stated above, the research distinguishes children by age group: 10 and 15 year *versus* 16 and 24 years. This classification is already done that concerns, habits and social patterns of both groups are quite different. In addition, it allows considers the importance of the paid employment in the group of teenagers. The number of children with these characteristics amounts to 2293 (997 individuals aged between 10 and 15 years and 1316 aged between 16 and 24 year) distributed among 1675 households.

Table 1 shows the descriptive statistics of the daily time spent in the above activities by both groups of children. For the collective of people aged between 10 and 15 years old, it is possible to distinguish between necessary or compulsory activities and free time activities. The first group is composed by "personal care" and "school" and they account about 16 daily hours on average. As regards the second group of activities, "tv or radio" and "meeting" are the most representative, since children spend around 2 hours and 1.25 in such activities, respectively. Some changes are observed if the focus is on the collective of people aged between 16 and 24 years old. In this case the personal care and the school only count about 14 hours, this is due to the fact that with these ages the individuals can choose between staying or leaving the educational system. With respect to the rest of activities, "meeting" and "active leisure" are the better ranked, with more than two hours, followed by "tv or radio" with almost 2 hours.

**Table 1. Hours that children spend doing various activities on an average day**

| Main activity | Aged 10-15 | | Aged 16-24 | | Total | |
|---|---|---|---|---|---|---|
| | Media | Std. | Media | Std. | Media | Std. |
| **Personal care** | 12.45 | 1.88 | 11.80 | 2.64 | 12.10 | 2.35 |
| **Paid work** | 0.02 | 0.34 | 1.10 | 2.77 | 0.65 | 2.18 |
| **Education** | | | | | | |
| School | 3.80 | 3.56 | 2.30 | 3.42 | 2.96 | 3.55 |
| Study | 0.20 | 0.52 | 0.27 | 1.05 | 0.22 | 0.87 |
| **Free time** | | | | | | |
| Household and family care | 0.70 | 1.01 | 0.90 | 1.34 | 0.83 | 1.22 |
| Meeting | 1.24 | 1.94 | 2.00 | 2.45 | 1.69 | 2.28 |
| Active leisure | 0.92 | 1.68 | 1.65 | 2.26 | 1.35 | 2.06 |
| Passive leisure | 0.23 | 0.82 | 0.22 | 0.74 | 0.23 | 0.78 |
| Sport and outdoor activities | 0.90 | 1.43 | 0.83 | 1.37 | 0.86 | 1.40 |
| Hobbies | 0.15 | 0.17 | 0.04 | 0.12 | 0.08 | 0.15 |
| Computer | 0.05 | 0.09 | 0.09 | 0.15 | 0.07 | 0.13 |
| Media: Reading | 0.03 | 0.04 | 0.01 | 0.06 | 0.02 | 0.05 |
| Media: TV or Radio | 1.95 | 1.71 | 1.60 | 1.71 | 1.79 | 1.71 |
| Travel and unspecified. time | 1.10 | 0.94 | 1.20 | 1.12 | 1.19 | 1.05 |
| **Total Time** | 24 | | 24 | | 24 | |
| **Number of observations** | 977 | | 1,316 | | 2,293 | |

**Source:** Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

Table 2 y 3 shows the descriptive statistics of the daily time spent in the above activities by both groups of children, respectively, differentiating by 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 main results obtained are, first, that the activity "tv or radio" has the highest incidence, especially, for children aged between 10 and 15 years where the percentage of individuals of zero minute is around 15%. This percentage is about 25% if the persons of ages between 16 and 24 years. For all the cases, the maximum duration of this activity is reached for the individuals living with fathers with less than lower secondary education. In particular, the time spent watching tv or listening radio has a conditional mean about 2,5 hours. Second, meeting is the next activity with the highest percentage of participation (about 43% and 28% for kids and teenagers. respectively). Another interesting results is that the activity of reading has the highest incidence for children if the parental education is higher education. Especially for children aged 10-15 years old with a participation rate of 25%. Anyway the time spent in this activity is insignificant. Finally, the time allocated to the activity "study out the school" by the children with ages ranging between 16 and 24 years is almost double than the corresponding one to the rest of individuals (a conditional mean about 3 hours).

**Table 2. Hours that children aged 10-15 years spend doing various activities on an average day**

| Main activity | Less than upper secondary education | | Upper secondary education[a] | | Higher education[b] | |
|---|---|---|---|---|---|---|
| | Mean | Std. | Mean | Std. | Mean | Std. |
| **Personal care** | | | | | | |
| Unconditional mean | 12.48 | 1.96 | 12.04 | 1.64 | 12.35 | 1.91 |
| Conditional mean | 12.48 | 1.96 | 12.04 | 1.64 | 12.35 | 1.91 |
| % with zero hours | 0 | | 0 | | 0 | |
| **Paid work** | | | | | | |
| Unconditional mean | 0.04 | 0.56 | - | - | - | - |
| Conditional mean | 5.16 | 4.05 | - | - | - | - |
| % with zero hours | 99.16 | | 100 | | 100 | |
| **Study: School** | | | | | | |
| Unconditional mean | 3.38 | 3.46 | 4.48 | 3.54 | 3.73 | 3.61 |
| Conditional mean | 5.35 | 2.90 | 5.68 | 3.01 | 5.50 | 3.07 |
| % with zero hours | 36.87 | | 21.10 | | 32.17 | |
| **Study: out of school** | | | | | | |
| Unconditional mean | 0.07 | 0.34 | 0.22 | 0.71 | 0.17 | 0.52 |
| Conditional mean | 1.40 | 0.67 | 1.70 | 1.15 | 1.42 | 0.70 |
| % with zero hours | 94.97 | | 86.70 | | 87.78 | |
| **Household and family care** | | | | | | |
| Unconditional mean | 0.73 | 1.07 | 0.64 | 0.88 | 0.64 | 1.02 |
| Conditional mean | 1.27 | 1.14 | 1.05 | 0.91 | 1.03 | 1.12 |
| % with zero hours | 42.18 | | 38.99 | | 37.41 | |

| Main activity | Less than upper secondary education | | Upper secondary education[a] | | Higher education[b] | |
|---|---|---|---|---|---|---|
| | Mean | Std. | Mean | Std. | Mean | Std. |
| **Volunteer work and meetings** | | | | | | |
| Unconditional mean | 1.29 | 2.06 | 1.11 | 1.63 | 1.25 | 1.98 |
| Conditional mean | 2.34 | 2.29 | 1.88 | 1.75 | 2.21 | 2.19 |
| % with zero hours | 44.69 | | 40.83 | | 43.39 | |
| **Active leisure** | | | | | | |
| Unconditional mean | 0.97 | 1.77 | 0.82 | 1.49 | 0.92 | 1.68 |
| Conditional mean | 2.15 | 2.10 | 1.81 | 1.76 | 1.91 | 2.00 |
| % with zero hours | 55.03 | | 54.59 | | 51.87 | |
| **Passive leisure** | | | | | | |
| Unconditional mean | 0.20 | 0.71 | 0.21 | 0.67 | 0.24 | 0.96 |
| Conditional mean | 1.34 | 1.35 | 1.15 | 1.17 | 1.49 | 1.93 |
| % with zero hours | 84.92 | | 81.19 | | 83.29 | |
| **Sport and outdoor activities** | | | | | | |
| Unconditional mean | 0.94 | 1.32 | 0.79 | 1.40 | 0.91 | 1.53 |
| Conditional mean | 2.02 | 1.25 | 2.08 | 1.58 | 2.12 | 1.70 |
| % with zero hours | 53.07 | | 61.93 | | 56.86 | |
| **Hobbies** | | | | | | |
| Unconditional mean | 0.12 | 0.16 | 0.11 | 0.17 | 0.13 | 0.18 |
| Conditional mean | 0.23 | 0.17 | 0.21 | 0.17 | 0.22 | 0.19 |
| % with zero hours | 46.37 | | 48.17 | | 43.14 | |
| **Computer** | | | | | | |
| Unconditional mean | 0.04 | 0.08 | 0.05 | 0.09 | 0.05 | 0.10 |
| Conditional mean | 0.13 | 0.09 | 0.15 | 0.11 | 0.15 | 0.11 |
| % with zero hours | 67.04 | | 64.22 | | 64.09 | |
| **Media: Reading** | | | | | | |
| Unconditional mean | 0.01 | 0.03 | 0.01 | 0.03 | 0.02 | 0.04 |
| Conditional mean | 0.07 | 0.04 | 0.07 | 0.05 | 0.08 | 0.06 |
| % with zero minutes | 87.43 | | 83.03 | | 74.31 | |
| **Media: TV or Radio** | | | | | | |
| Unconditional mean | 2.24 | 1.78 | 1.81 | 1.64 | 1.68 | 1.62 |
| Conditional mean | 2.54 | 1.68 | 2.16 | 1.56 | 2.01 | 1.57 |
| % with zero minutes | 12.01 | | 16.06 | | 16.46 | |
| **Travel and unsp. time** | | | | | | |
| Unconditional mean | 0.97 | 0.89 | 1.05 | 0.86 | 1.12 | 1.00 |
| Conditional mean | 1.17 | 0.85 | 1.20 | 0.81 | 1.33 | 0.96 |
| % with zero minutes | 16.20 | | 12.39 | | 15.46 | |
| **Nº Observations** | 358 | | 218 | | 401 | |

**Notes:**
 (a) This category include individuals with medium level vocational and technical training
(b) The educational level of higher education is composed by upper level vocational and technical training, short-cycle higher education and long-cycle higher education.
**Source:** Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

**Table 3. Hours that children aged 16-24 years spend doing various activities on an average day**

| Main activity | Less than upper secondary education | | Upper secondary education[a] | | Higher education[b] | |
|---|---|---|---|---|---|---|
| | Mean | Std. | Mean | Std. | Mean | Std. |
| **Personal care** | | | | | | |
| Unconditional mean | 12.63 | 2.65 | 11.75 | 2.50 | 11.90 | 2.70 |
| Conditional mean | 12.63 | 2.65 | 11.75 | 2.50 | 11.90 | 2.70 |
| % with zero hours | 0 | | 0 | | 0 | |
| **Paid work** | | | | | | |
| Unconditional mean | 1.45 | 3.05 | 1.01 | 2.69 | 0.73 | 2.30 |
| Conditional mean | 6.69 | 2.80 | 7.30 | 2.54 | 6.77 | 2.88 |
| % with zero hours | 78.34 | | 86.12 | | 89.22 | |
| **Study: School** | | | | | | |
| Unconditional mean | 1.73 | 3.10 | 2.62 | 3.45 | 3.04 | 3.65 |
| Conditional mean | 5.70 | 3.01 | 5.77 | 2.84 | 6.24 | 2.70 |
| % with zero hours | 69.54 | | 54.57 | | 51.23 | |
| **Study: out of school** | | | | | | |
| Unconditional mean | 0.28 | 1.11 | 0.27 | 0.95 | 0.22 | 1.01 |
| Conditional mean | 2.89 | 2.22 | 2.47 | 1.66 | 2.86 | 2.41 |
| % with zero hours | 90.02 | | 88.96 | | 92.16 | |
| **Household and family care** | | | | | | |
| Unconditional mean | 1.11 | 1.50 | 0.91 | 1.25 | 0.72 | 1.09 |
| Conditional mean | 1.76 | 1.55 | 1.44 | 1.31 | 1.20 | 1.18 |
| % with zero hours | 36.72 | | 36.59 | | 39.95 | |
| **Volunteer work and meetings** | | | | | | |
| Unconditional mean | 1.88 | 2.41 | 2.16 | 2.52 | 2.01 | 2.44 |
| Conditional mean | 2.80 | 2.46 | 2.94 | 2.53 | 2.75 | 2.46 |
| % with zero hours | 32.83 | | 26.50 | | 23.53 | |
| **Active leisure** | | | | | | |
| Unconditional mean | 1.45 | 2.11 | 1.87 | 2.33 | 1.79 | 2.83 |
| Conditional mean | 2.50 | 2.23 | 2.84 | 2.33 | 2.73 | 2.46 |
| % with zero hours | 43.49 | | 34.07 | | 34.31 | |
| **Passive leisure** | | | | | | |
| Unconditional mean | 0.25 | 0.77 | 0.18 | 0.72 | 0.24 | 0.71 |
| Conditional mean | 1.21 | 1.29 | 1.10 | 1.43 | 1.10 | 1.15 |
| % with zero hours | 79.02 | | 82.97 | | 77.45 | |
| **Sport and outdoor activities** | | | | | | |
| Unconditional mean | 0.83 | 1.30 | 0.73 | 1.20 | 0.91 | 1.56 |
| Conditional mean | 2.07 | 1.28 | 1.85 | 1.26 | 2.35 | 1.69 |
| % with zero hours | 59.90 | | 60.57 | | 61.03 | |

| Main activity | Less than upper secondary education | | Upper secondary education[a] | | Higher education[b] | |
|---|---|---|---|---|---|---|
| | Mean | Std. | Mean | Std. | Mean | Std. |
| **Hobbies** | | | | | | |
| Unconditional mean | 0.03 | 0.10 | 0.04 | 0.13 | 0.04 | 0.11 |
| Conditional mean | 0.18 | 0.14 | 0.24 | 0.21 | 0.18 | 0.17 |
| % with zero hours | 78.51 | | 80.13 | | 74.75 | |
| **Computer** | | | | | | |
| Unconditional mean | 0.09 | 0.15 | 0.10 | 0.15 | 0.08 | 0.13 |
| Conditional mean | 0.20 | 0.16 | 0.19 | 0.16 | 0.15 | 0.14 |
| % with zero hours | 54.48 | | 47.63 | | 48.53 | |
| **Media: Reading** | | | | | | |
| Unconditional mean | 0.01 | 0.05 | 0.01 | 0.06 | 0.01 | 0.05 |
| Conditional mean | 0.13 | 0.10 | 0.13 | 0.12 | 0.10 | 0.07 |
| % with zero minutes | 89.34 | | 87.07 | | 81.86 | |
| **Media: TV or Radio** | | | | | | |
| Unconditional mean | 1.86 | 1.80 | 1.62 | 1.63 | 1.48 | 1.61 |
| Conditional mean | 2.38 | 1.71 | 2.16 | 1.55 | 2.03 | 1.56 |
| % with zero minutes | 22.00 | | 24.61 | | 27.21 | |
| **Travel and unsp. time** | | | | | | |
| Unconditional mean | 1.27 | 1.17 | 1.15 | 0.98 | 1.18 | 1.05 |
| Conditional mean | 1.47 | 1.13 | 1.35 | 0.93 | 1.55 | 1.09 |
| % with zero minutes | 13.37 | | 14.51 | | 11.42 | |
| **Nº Observations** | 591 | | 317 | | 408 | |

**Notes:**
(a) This category include individuals with medium level vocational and technical training
(b) The educational level of higher education is composed by upper level vocational and technical training, short-cycle higher education and long-cycle higher education.
**Source:** Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

The previous comparisons are relative to the time use activity-by-activity. To achieve a measure more informative of the differences among groups, it is necessary to obtain an index that summarizes the separation in "activity profiles". In this way, it is possible to measure how overall time use differs according to the parental education. The measure used is a dissimilarity index, particularly, is the weighted absolute deviation index[2] (Stewart, 2006):

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

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[2]  The weights are equal to the fraction of total time spent in each activity.

where $a_i$ and $b_i$ are the times spent in activity i by group a and b, respectively, and k is the number of activities. This index ranges between 0 and 1, with 0 indicating that the two groups spend the same amount of time in each activity and 1 meaning that the two groups don't have activities in common. A relevant and desirable property of this index is its insensitivity to the level of aggregation of activities. The indexes obtained are arranged in Table 4. On one hand, it is observed that the children aged 16-24 years show highest dissimilarity than those individuals with ages between 10 and 15 years when they are grouped by parental education. In particular, the highest difference corresponds to the comparison between educational levels of less than lower secondary education and higher education.

**Table 3. Dissimilarity index between according to parental education**

| | Children aged 10-15 years | Children aged 16-24 years |
|---|---|---|
| **Parental education** | | |
| Less than upper second educ. *versus* upper second. educ. | 0.06 | 0.07 |
| Less than upper second educ. *versus* higher education | 0.04 | 0.08 |
| Upper second educ. *versus* higher education. | 0.03 | 0.04 |

**Source:** Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

The difference according the time use patterns also are controlled in the estimates by another personal characteristics such as gender, age, geographic origin, main activity status of the father and mother, current Spanish region of residence and size of municipality. The descriptive statistics about these variables appear in the table A1 of the appendix.

## MODEL AND ECONOMETRIC SPECIFICATION

This section is devoted to the specification of the model that analyses if the differences in the children' time use observed in the descriptive analysis by parental education remain once the rest of personal and household characteristics are controlled. An important consideration when time-data are used in the regression analysis is that for many activities a significant proportion of individual report zero minutes. This occurs for all the activities analysed in this paper, except for the activity related with the "personal care".

Traditionally, economic literature has used Tobit model for account for such censoring. The main restriction of this methodology is that assumes that the underlying processes determining the participation and the time spent in the activity are the same. This restrictive assumption can be overcome if a double-hurdle model (Cragg, 1971) is applied, 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:

$$y_i^* = x_{1i}'\gamma + \varepsilon_{1i} \tag{3}$$

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:

$$E(y_i \mid y_i^* > 0, x_{2i}) = x_{2i}' \beta + E(\varepsilon_{2i} \mid y_i^* > 0, x_{2i}) \qquad (4)$$

$X_{1i}$ and $x_{2i}$ are the vectors of explanatory variables. In this case, it is supposed that both vectors contains the same regressors, which are the following: gender, age, parental education, parental occupation, household composition, geographic origin, health status, size of municipality and current Spanish region of residence. $\gamma$ and $\beta$ are the vectors of unknown coefficients. Moreover, $\begin{pmatrix} \varepsilon_{1i} \\ \varepsilon_{2i} \end{pmatrix} \approx N \left[ \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & \sigma^2 \end{pmatrix} \right]$, the diagonal of the covariance matrix denotes that the two error terms are assumed to be independently distributed.

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

$$L = \prod_{y_i=0}[1 - \Phi(x_{1i}'\gamma)] * \prod_{y_i>0}\left[ \Phi(x_{1i}'\beta)\frac{1}{2\pi\sigma}\exp\left\{-(y_i - x_{2i}\beta)^2 / 2\sigma^2\right\} / \Phi(x_{2i}\beta/\sigma) \right] \qquad (5)$$

where $\Phi$ is the cumulative distribution function of the normal distribution.

In this equation, the first term corresponds to the contributions of all the observations with an observed zero minutes for participation in an activity. The second term accounts for the contribution of all the observations with non-zero minutes.

By the estimated coefficients of the double-hurdle model is possible to obtain the marginal effects to measure accurately the influence of the regressors on the incidence and time spent in a particular activity. For a given observation, the marginal effect of an independent variable $x_j$ around the probability that $y_i^* > 0$ is:

$$\frac{\partial P(y_i^* > 0 \mid x_{1i})}{\partial x_{j,i}} = \gamma_j \phi(x_{1i}'\gamma) \qquad (6)$$

where $\gamma_j$ is the coefficient on $x_j$ in equation (3). On other hand, the partial effect of $x_j$ on the expected value of $y_i$ , given $y_i^* > 0$ is:

$$\frac{\partial E(y_i \mid y_i^* > 0, x_{2i})}{\partial x_{j,i}} = \beta_j[1 - \lambda(x_{2i}'\beta/\sigma)\{x_{2i}'\beta/\sigma + \lambda(x_{2i}'\beta/\sigma)\}] \qquad (7)$$

where $\beta_j$ is the coefficient on $x_j$ in equation (4).

Once the marginal effects are obtained for all observations, the average partial effect is calculated for each independent variable (Burke, 2009). The double hurdle-model is estimated separately for each activity, excluding "personal care", "school" and "passive leisure". "Personal care" is not considered because its percentage of participation is 100%, so this activity cannot be considered in the proposed econometric model. The time spent at school also is excluded from the analysis, since it depends on the trimester where the individual is observed. So, the initial sample would require an additional selection and this would decrease significantly the number of observations. Finally, the incidence and time spent in "passive leisure" is not modelled, since it is not itself an specific activity because with this denomination appears activities as diverse as to do nothing, to think about a problem, to talk to a cat…

## RESULTS

Estimates of the coefficients that appear in the model for the first hurdle, that is participate in the activity, are reported in tables 4 and 5 for children aged 10-15 years and 16-24 years, respectively. For the younger age group, parental education is positively related with the participation in the activity "study out of school" and "reading" and negatively with "doing sport" and "watching TV or listening radio". Some differences are observed for the older group, now

**Table 4. Maximum likelihood estimates of the double hurdle models (First hurdle): children aged 10-15 years old[1]**

| Regressors | Study out of the school | Household and family care | Meeting | Active Leisure | Sport | Hobbies | Computer | Media: Reading | Media: TV or Radio |
|---|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | | |
| Male | -0.054 | -0.462*** | -0.194** | -0.138* | 0.266** | 0.413*** | -0.171** | -0.143^ | -0.033 |
| **Age** | 0.001 | 0.033 | 0.090*** | 0.131*** | 0.034 | -0.223*** | 0.228*** | -0.040^ | -0.048* |
| **Geographic origin** | | | | | | | | | |
| UE | -0.484 | -0.235 | 0.061 | 0.098 | -0.411^ | -0.010 | 0.057 | -0.001 | -0.611* |
| No UE | -0.079 | 0.092 | -0.109 | -0.191 | -0.231^ | -0.308** | 0.188 | -0.167 | 0.121 |
| **Parental education** | | | | | | | | | |
| Upper secondary education | 0.533** | 0.050 | 0.128 | 0.029 | -0.290** | -0.029 | 0.046 | 0.702 | -0.209^ |
| Higher education | 0.445** | 0.079 | 0.090 | 0.121 | -0.178* | 0.062 | 0.074 | 0.265^ | -0.235* |
| **Main activity status of father and mother** | | | | | | | | | |
| Father only employed | 0.084 | 0.076 | 0.191 | 0.199* | 0.309* | -0.108 | 0.354** | 0.039 | 0.012 |
| Mother only employed | 0.309 | -0.136 | 0.076 | 0.122 | 0.118 | -0.085 | 0.225 | 0.045 | 0.111 |
| Both father and mother employed | 0.267 | 0.125 | 0.046 | 0.082 | 0.175 | -0.084 | 0.262* | 0.265^ | 0.124 |
| **Current Spanish region of residence** | | | | | | | | | |
| Northwest | -0.310^ | -0.080 | -0.211 | -0.205 | 0.151 | -0.033 | 0.070 | 0.334* | -0.361* |
| Northeast | -0.120 | 0.001 | 0.035 | 0.030 | 0.068 | -0.090 | -0.131 | 0.043 | 0.088 |
| Madrid | -0.524** | 0.077 | -0.129* | -0.026 | 0.188 | -0.052 | -0.116 | 0.438** | 0.058 |
| Center | -0.002 | -0.175 | -0.137 | -0.085 | 0.032 | -0.128 | -0.069 | 0.244* | 0.122 |
| East | -0.245 | 0.072 | -0.202* | -0.138 | -0.070 | -0.255* | 0.033 | -0.167 | 0.065 |
| **Size of the municipality** | | | | | | | | | |
| Less than 10,000 inhabitants | -0.106 | 0.128 | 0.220** | 0.187* | 0.010 | -0.058 | -0.076 | -0.173 | 0.014 |
| **Constant** | -1.620** | -0.049 | -0.952** | -1.809*** | -0.759 | 2.906*** | -3.429 | -0.666* | 1.721*** |

**Notes:**
(1) The reference is an Spanish woman, living in a household whose parents have an educational level less than upper secondary and they are not employed in a municipality with more than 10,000 inhabitants of the region South.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%.
**Source**: Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

**Table 5. Maximum likelihood estimates of the double hurdle models (First hurdle): children aged 16-24 years old[1]**

| Regressors | Paid Work | Study | Household and family care | Meeting | Active Leisure | Sport | Hobbies | Computer | Media: Reading | Media: TV or Radio |
|---|---|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | | | |
| Male | 0.071 | -0.141^ | -0.588*** | -0.099 | -0.135* | 0.177** | 0.571*** | -0.033 | -0.389*** | -0.048 |
| **Age** | 0.230*** | -0.021 | -0.009 | -0.009 | -0.020 | -0.020 | -0.039** | -0.060*** | 0.010 | 0.001 |
| **Geographic origin** | | | | | | | | | | |
| UE | 0.752*** | -0.376 | -0.268 | -0.054 | -0.094 | 0.114 | -1.019** | 0.181 | 0.272 | -0.538* |
| No UE | 0.415*** | 0.025 | -0.196 | 0.148 | -0.179 | 0.167 | -0.464** | -0.057 | 0.198 | 0.229 |
| **Education** | | | | | | | | | | |
| Upper secondary | -0.378** | 0.052 | 0.062 | 0.192** | 0.121 | -0.032 | -0.260** | 0.235** | 0.100 | -0.018 |
| Medium level vocat. and tech. training | 0.274* | -0.263 | 0.129 | -0.068 | -0.157 | 0.008 | 0.100 | 0.217^ | -0.027 | -0.092 |
| Upper level vocat. and tech.l training | 0.254* | 0.212 | 0.017 | 0.259 | 0.143 | 0.185 | -0.192 | -0.161 | -0.073 | -0.138 |
| Short-cycle higher education | -0.093 | -0.061 | -0.004 | 0.086 | 0.068 | 0.220 | -0.096 | 0.031 | 0.001 | -0.352* |
| Long-cycle higher education | -0.324 | -0.003 | 0.195 | -0.201 | -0.232 | 0.192 | -0.284 | -0.213 | 0.638** | -0.015 |
| **Parental education** | | | | | | | | | | |
| Upper secondary education | -0.282** | 0.042 | 0.019 | 0.189** | 0.241** | -0.015 | -0.129 | 0.090 | 0.091 | -0.079 |
| Higher education | -0.337** | -0.215* | -0.056 | 0.309** | 0.237** | -0.052 | 0.057 | -0.037 | 0.319** | -0.178* |
| **Main activity status of the father and mother** | | | | | | | | | | |
| Father only employed | 0.133 | 0.182 | -0.290** | -0.154 | -0.103 | 0.047 | 0.202* | 0.358** | 0.150 | -0.200* |
| Mother only employed | 0.282** | 0.230 | -0.047 | 0.039 | 0.073 | -0.128 | 0.247* | 0.083 | 0.009 | -0.085 |
| Both father and mother employed | 0.006 | 0.287* | -0.023 | -0.091 | 0.024 | 0.044 | 0.107 | 0.396*** | 0.113 | -0.079 |
| **Current Spanish region of residence** | | | | | | | | | | |
| Northwest | 0.011 | -0.064 | -0.162 | -0.086 | -0.088 | -0.142 | 0.127 | 0.092 | - | 0.082 |
| Northeast | -0.033 | -0.313 | -0.084 | 0.058 | 0.085 | -0.108 | 0.117 | -0.037 | - | 0.120 |
| Madrid | 0.364*** | -0.343* | -0.239* | -0.154 | -0.136 | -0.241** | -0.040 | 0.132 | - | -0.084 |
| Center | 0.099 | -0.044 | 0.036 | 0.101 | 0.134 | -0.242 | 0.132 | 0.007 | - | -0.022 |
| East | 0.249 | -0.046 | -0.050 | -0.130 | -0.096 | -0.120 | 0.049 | 0.123 | - | -0.013 |
| **Size of the municipality** | | | | | | | | | | |
| Less than 10,000 inhabitants | 0.227*** | -0.357** | -0.033 | 0.031 | 0.025 | 0.003 | -0.219 | -0.114 | -0.022 | -0.159* |
| **Constant** | -5.786*** | -0.855* | 0.974** | 0.694** | 0.622 | 0.165 | -0.359 | 0.793** | -1.383** | 0.962** |

(1) The reference is an Spanish woman with an educational level less than upper secondary, living in a household whose parents have an educational level less than upper secondary and they are not employed in a municipality with more than 10,000 inhabitants of the region South.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%.
**Source**: Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

the activities of "meeting", "active leisure" and "reading" are positively influenced by parental education, while "study out of the school", "watching TV or radio" and "paid work" are affected negatively. Regarding the "paid work", the result is explained because children with fathers less educated may have greater financial needs and they can not invest time in skill-building

activities that may have a greater value in the long run, but less payoff in the short term. Another interesting results are, first, the existence of gender roles in the children's time allocation since the variable gender explain their pattern time. So, the incidence of the activity "sport" and "hobbies" is higher for male than for female. On the contrary, women participate more than men in the following activities "household and family care", "active leisure" and "reading". In addition, if the child is woman aged between 10 and 15 years has more episodes with "meeting" and use of the computer. Second, age is also a relevant regressor that affects positively the probability of participation in the activities of "meeting", "active leisure" and "computer" for the younger age group, and the incidence of "paid work" for the individuals aged between 16 and 24 years. On other hand, the country of origin is important to explain the incidence of "paid work", in particular, the foreign child has more probability of work than the native children. With respect to the activity status of the fathers, it is observed that children aged 16-24 years with mother employed increase their incidence in the activity "household and family care". The results about the set of regional dummy variables and the size of the municipality shed some interesting conclusions. Children aged 10-15 years and living in Madrid have less probability of studying out the school and of attending a meeting, but they have more episodes of reading than children living in the South region. Furthermore, kids living in municipality less than 10,000 inhabitants have more probability of active leisure. The interrelations between area of residence and activity vary for the older group. Now, living in Madrid influences negatively on the probability of having episodes of study out the school, household and family care and sport, but it affects positively the probability of "paid work" which is associated with the existence of more labour offers and career opportunities than the rest of Spanish regions. With respect to the size of the municipality, it should be noted that the first age group is more likely to attend a meeting and doing active leisure activities if their households are in municipalities with less than 10,000 inhabitants. Finally, it is noteworthy that, for the second group, the children education has been included in the analysis as regressor given that its age range is broader than for the first group. The conclusions more interesting about the influence on the educational dummy variables are, on one hand, that children with upper level vocational and technical training have more probability of working and, on other hand, that children with long cycle higher education have more episodes of reading.

Estimates of the model's coefficients that determines the time spent in the certain activity are showed in table 6 and 7 for children aged 10-15 years old and 16-24, respectively. Regarding the effects on parental education on the amount of time spent by the children in each activity, the following results are highlighted. First, children with highly educated parents spend less time on television, this results is coherent with the predictions of the economic literature (see, for example, Bianchi and Robinson, 1997; Hofferth and Sandberg 2001). The influence of the parental education on the time allocated to the activity "computer" depends on the age of the child, positive for children aged 10-15 and 16-24 year. The explanation of this result may be that the more educated parents can encourage learning via computers for more young people, while they discourage it when children are older and they can use unproductively the computers. With respect to the activity "household and family", the relation between parental educa-

tion and this activity is negative for children aged 16-24 year, suggesting that they do less housework than their counterparts with less well-educated parents, this result is similar to that obtained by Gager *et al.* (1999). Finally, another relevant conclusion is that parental education can influence on the episodes of reading but it can not effect on the time spent on such activity.

**Table 6. Maximum likelihood estimates of the double hurdle models (Second hurdle): children aged 10-15 years old[1]**

| Regressors | Study out of the school | Household and family care | Meeting | Active Leisure | Sport | Hobbies | Computer | Media: Reading | Media: TV or Radio |
|---|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | | |
| Male | -0.153 | -2.827** | 1.393 | 0.758 | -0.136 | 0.114** | -0.037 | -0.019 | 0.222 |
| **Age** | 0.054 | 0.105 | 2.391** | 2.366* | 0.164* | -0.051** | 0.013^ | 0.009* | 0.077 |
| **Geographic origin** | | | | | | | | | |
| UE | -0.192 | 3.409 | 9.330* | 14.462 | -0.852 | 0.074 | 0.042 | 0.076* | 1.254^ |
| Not UE | 0.840** | 0.977 | -2.160 | 0.280 | -0.437 | -0.101 | 0.006 | 0.053* | 0.709* |
| **Parental education** | | | | | | | | | |
| Upper secondary education | 0.092 | -1.949 | -5.651^ | -5.368 | 0.133 | -0.049 | 0.070* | -0.001 | -0.580** |
| Higher education | 0.005 | -1.517 | -0.679 | -4.523 | 0.116 | -0.001 | 0.091** | 0.029 | -0.628** |
| **Main activity status of father and mother** | | | | | | | | | |
| Father only employed | 0.656 | -1.837 | -0.367 | 1.219 | -0.050 | 0.010 | -0.032 | 0.035 | -0.485 |
| Mother only employed | 1.294** | 0.287 | -1.204 | 1.122 | -0.207 | 0.004 | -0.067 | -0.007 | -0.643 |
| Both father and mother employed | 0.792 | -1.648 | -3.734 | 0.127 | 0.094 | 0.068 | -0.114** | 0.005 | -1.127** |
| **Current Spanish region of residence** | | | | | | | | | |
| Northwest | -0.336 | -3.180^ | 7.253^ | 12.340 | -0.344 | -0.016 | -0.034 | 0.019 | 0.067 |
| Northeast | -0.500* | -5.094** | 9.063* | 14.950 | -0.375 | -0.024 | -0.029 | -0.018 | -0.239 |
| Madrid | -0.573 | 0.594 | 6.976^ | 8.064 | 0.1559 | -0.131^ | -0.047 | -0.012 | 0.251 |
| Center | -0.424 | 0.900 | 6.879* | 13.109 | -0.197 | 0.018 | 0.009 | -0.010 | 0.060 |
| East | -0.264 | -2.115 | 5.417 | 8.344 | 0.555 | -0.027 | 0.014 | 0.003 | 0.177 |
| **Size of the municipality** | | | | | | | | | |
| Less than 10,000 inhabitants | 0.286 | -1.963 | 4.951* | 3.262 | -1.038** | 0.029 | 0.026 | 0.018 | -0.158 |
| **Constant** | 0.074 | -4.413 | -51.89** | -65.871 | -1.176 | 0.481** | -0.106 | -0.085 | 0.611 |

**Notes:**
(1) The reference is an Spanish woman, living in a household whose parents have an educational level less than upper secondary and they are not employed in a municipality with more than 10,000 inhabitants of the region South.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%.
**Source**: Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

**Table 7. Maximum likelihood estimates of the double hurdle models (Second hurdle): children aged 16-24 years old[1]**

| Regressors | Paid Work | Study out of the school | Household and family care | Meeting | Active Leisure | Sport | Hobbies | Computer | Media: Reading | Media: TV or Radio |
|---|---|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | | | |
| Male | 0.655* | 1.997*** | -2.077*** | 2.217** | 2.204** | 0.625** | 0.322 ** | 0.147** | -0.048 | 0.041 |
| **Age** | 0.357*** | 0.035 | 0.378** | -0.175 | -0.011 | -0.132** | 0.029* | 0.001 | 0.008 | 0.059 |
| **Geographic origin** | | | | | | | | | | |
| UE | 0.669 | -1.234 | 0.035 | -7.129^ | -8.952* | 0.620 | 0.524 | -0.038 | 0.154 | -0.242 |
| Not UE | 0.099 | -0.788 | 1.637^ | -5.658^ | -3.479* | -0.652 | 0.047 | 0.018 | -0.085 | 1.151** |
| **Education** | | | | | | | | | | |
| Upper secondary | -0.543 | 1.619** | 1.304* | -0.825 | -0.127 | 0.558** | -0.268* | -0.079 | -0.057 | -0.483^ |
| Medium level vocat. and tech. training | -0.415 | 1.744^ | 2.490** | 1.971 | 2.787** | 0.703^ | -0.267 | 0.046 | -0.040 | 0.206 |
| Upper level vocat. and tech.l training | -0.626 | 3.837*** | 0.223 | -2.558 | -3.845* | 0.838* | -0.089 | -0.129 | 0.122 | -0.150 |
| Short-cycle higher education | 1.462** | -0.796 | -0.618 | 4.440** | 2.739* | 0.139 | -0.624* | -0.058 | 0.077 | -0.617 |
| Long-cycle higher education | 0.485 | 7.293*** | -1.011 | 1.922 | -1.239 | 0.261 | -0.597 | -0.615 | 0.090 | -1.257^ |
| **Parental education** | | | | | | | | | | |
| Upper secondary education | 0.374 | -1.564** | -1.232* | -0.001 | 0.625 | -0.534* | 0.238* | 0.013 | -0.012 | -0.417 |
| Higher education | -0.303 | -0.957^ | -2.190** | -0.478 | 0.586 | 0.376 | -0.015 | -0.176** | -0.081 | -0.888** |
| **Main activity status of father and mother** | | | | | | | | | | |
| Father only employed | 1.137** | -0.045 | -1.270^ | 0.103 | 0.232 | -0.815** | 0.185 | -0.003 | -0.048 | 0.040 |
| Mother only employed | 0.998* | 0.001 | 1.169^ | 2.504** | 2.175* | -0.826** | 0.036 | -0.012 | -0.084 | -0.298 |
| Both father and mother employed | 1.102* | 1.666** | -0.739 | -0.952 | -0.825 | -0.861* | 0.149 | -0.076 | -0.012 | 0.428 |
| **Current Spanish region of residence** | | | | | | | | | | |
| Northwest | 0.507 | -0.695 | -1.171 | -1.175 | 1.285 | 0.458 | -0.190 | -0.025 | - | 0.086 |
| Northeast | -0.388 | -0.351 | -2.416** | 1.832 | 2.292* | 0.271 | 0.225^ | -0.276** | - | 0.001 |
| Madrid | -0.048 | 0.246 | -3.341*** | 1.583 | 2.278* | 0.753^ | 0.093 | -0.035 | - | -0.234 |
| Center | 0.422 | -0.595 | -1.700** | 1.581 | 2.078* | 0.673^ | -0.032 | -0.146* | - | -0.854** |
| East | -0.001 | -1.199^ | -2.156** | -1.949 | -1.015 | 0.487 | 0.035 | -0.080 | - | -0.040 |
| **Size of the municipality** | | | | | | | | | | |
| Less than 10,000 inhabitants | 0.428 | 0.060 | 0.913 | 0.747 | 0.422 | -0.062 | -0.031 | -0.078 | 0.050 | -0.694** |
| **Constant** | -2.203 | -0.205 | 3.177*** | -3.645 | -6.711* | 0.255 | -1.221 | -0.152 | -0.132 | 0.084 |

Notes:

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

(2) (***) Significant at 1%, (**) at 5%, (*) at 10%.

**Source**: Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

Another interesting results are, first, than boys spend less time doing "household and family care" than girls, but they allocate more time to "hobbies". In addition, if the children are aged 16-24, it is observed a difference positive in the time amount by boys and girls in the following activities: "study out of the school", "meeting", "active leisure" and "sport". Second, children from countries other than those of the European Union spend more time watching TV or listening radio. With respect to the activity status of the fathers, it is observed than children aged

10-15 years with both father and mother employed spend less time watching TV, this result is similar to that obtained by Hofferth and Sandberg (2001). Finally, for the older age group, the time spent in "household and family care" increases if the individual resides in the South region or in the Northwest region. To have a more accurate view of the influence of the education of parents on the allocation of the time of their sons, the marginal effects on the probability of participation in an particular activity and the time spent on it have been obtained (table 9). For the group of children aged 10-15 year, the main conclusions are the following. The probability of participation in the activity "study out of the school" is higher in 10 or 7.5 if the parental education is "upper secondary education" or "higher education", respectively. In addition, children with highly educated fathers (higher education) has an probability of having an episode of reading 8 points higher than the rest and, moreover, the incidence of the activity "watching TV or listening radio" is 5.5 points lower, and their expected time spent in this activity is around 20 minutes lower than children with less educated fathers. The previous results, regarding the activity "TV or radio", are practically reproduced for the older age group. Moreover, these children have peculiar traits. So, for example, children with more educated fathers have a probability around 5 and 9 point higher of participating in "meeting" and "active leisure", respectively than the rest of individuals. These children may benefit from more financial resources and an easier access to social networks which facilitates the participation in the above activities. Also, for this group, it is detected that the expected time spent in the activity "study out of the school" is lower in more than 30 minutes.

**Table 9. Marginal effects of the double hurdle: Parental education**

| | Paid Work | Study | Household and family care | Meeting | Active-Leisure | Sport | Hobbies | Computer | Media: Reading | Media: TV or Radio |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHILDREN AGED 10-15 YEAR ( PARTICIPATION)** | | | | | | | | | | |
| **Parental education** | | | | | | | | | | |
| Upper secondary education | - | 0.103** | 0.018 | 0.048 | 0.044 | -0.109** | -0.010 | 0.015 | 0.018 | -0.051* |
| Higher education | - | 0.075** | 0.029 | 0.034 | 0.009 | -0.068** | 0.022 | 0.025* | 0.080** | -0.055** |
| **DURATON** | | | | | | | | | | |
| **Parental education** | | | | | | | | | | |
| Upper secondary education | - | 0.068 | -0.183** | -0.463** | -0.335^ | 0.057 | -0.014 | 0.030 | -0.001 | -0.245** |
| Higher education | - | 0.057 | -0.149 | -0.062 | -0.331 | 0.050 | -0.001 | 0.035** | 0.015^ | -0.271^ |
| **CHILDREN AGED 16-24 YEAR ( PARTICIPATION)** | | | | | | | | | | |
| **Parental education** | | | | | | | | | | |
| Upper secondary education | 0.001 | 0.007 | 0.006 | 0.060** | 0.088* | -0.005 | -0.034** | 0.034 | 0.001 | -0.024 |
| Higher education | -0.001 | -0.033* | -0.020 | 0.045*** | 0.087** | -0.019 | 0.015 | -0.012 | 0.049** | -0.055** |
| **DURATON** | | | | | | | | | | |
| **Parental education** | | | | | | | | | | |
| Upper secondary education | 0.347 | -0.864** | -0.196 | -0.001 | 0.141 | -0.281** | 0.051* | 0.003 | -0.003 | -0.171** |
| Higher education | -0.279 | -0.553* | -0.336*** | -0.095 | 0.132 | 0.263 | -0.003 | -0.038* | -0.023* | -0.358** |

Notes:
(1) The reference is an Spanish woman with an educational level less than upper secondary, living in a household whose parents have an educational level less than upper secondary and they are not employed in a municipality with more than 10,000 inhabitants of the region South.
(2) (***) Significant at 1%, (**) at 5%, (*) at 10%.
**Source**: Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).

## CONCLUSIONS

This article has addressed the influence and the social impact of education from a different perspective to the adopted traditionally by the economic literature. In particular, this study has analysed how the parental education affects the time use of their children, in order to shed light on whether achieving a higher level of education benefits not only the current generation but also their descendants. The empirical strategy has been to use data from the STUS 2009-2010 (INE, 2011) by distinguishing children according their age group: 10 and 15 year versus 16 and 24 years. Subsequently, for each one of this subsamples, the incidence and the time spent on a group of activities has been analysed by estimating double-hurdle models and controlling the effect of the parental education and the influence of another personal and household characteristics. The main conclusions are, first, the patterns of the distribution of the time of both age groups is different, observing an increase of the time spent in the activities of "meeting" and "active leisure" for the older age group. Second, for children aged 10-15 years, parental education is positively related with productive activities such as "study out of school", "reading" and negatively related with unproductive activities such as "watching TV or listening radio". Third, for children aged 16-24, some differences are observed in the interrelations between parental education and time allocation. In particular, the effect of the fathers' human capital is negative on the "study out of the school" and the "household and family care", which can be initially considered as productivities activities, although the positive influence on the decrease of time spent "watching TV or listening radio" remain. These results can show that the greater influence of the education of parents on the time use of their children in productive activities appear before they reach adolescence. After reaching adolescence, the influences outside the family may decrease the influence of the parents on their children and, therefore the role of parental education on their behaviour.

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# APPENDIX

**Table A1. Descriptive statistics of the variables used in the estimates**

| | Children aged 10-15 years | | Children aged 16-24 years | |
|---|---|---|---|---|
| **Gender** | **Mean** | **Std. Dev** | **Mean** | **Std. Dev** |
| Male | 0.51 | 0.50 | 0.52 | 0.50 |
| Female | 0.49 | 0.50 | 0.48 | 0.50 |
| **Age** | 12.50 | 1.68 | 19.66 | 2.56 |
| **Geographic origin** | | | | |
| Spain | 0.87 | 0.32 | 0.93 | 0.26 |
| UE | 0.02 | 0.15 | 0.01 | 0.11 |
| Not UE | 0.09 | 0.29 | 0.06 | 0.23 |
| **Education** | | | | |
| Less than upper secondary education | - | - | 0.53 | 0.28 |
| Upper secondary | - | - | 0.27 | 0.44 |
| Medium level vocat. and tech. training | - | - | 0.07 | 0.25 |
| Upper level vocat. and tech.l training | - | - | 0.05 | 0.22 |
| Short-cycle higher education | - | - | 0.05 | 0.22 |
| Long-cycle higher education | - | - | 0.03 | 0.16 |
| **Parental education** | | | | |
| Less than upper secondary education[a] | 0.37 | 0.45 | 0.45 | 0.40 |
| Upper secondary education[g] | 0.22 | 0.41 | 0.24 | 0.42 |
| Higher education | 0.41 | 0.49 | 0.31 | 0.46 |
| **Main activity status of father and mother** | | | | |
| Father only employed | 0.27 | 0.44 | 0.26 | 0.44 |
| Mother only employed | 0.16 | 0.37 | 0.20 | 0.40 |
| Both father and mother employed | 0.40 | 0.49 | 0.33 | 0.47 |
| Father and mother not employed | 0.17 | 0.35 | 0.21 | 0.30 |
| **Current Spanish region of residence** | | | | |
| Northwest | 0.10 | 0.31 | 0.13 | 0.34 |
| Northeast | 0.19 | 0.39 | 0.15 | 0.36 |
| Madrid | 0.13 | 0.34 | 0.12 | 0.32 |
| Center | 0.14 | 0.35 | 0.17 | 0.37 |
| East | 0.16 | 0.37 | 0.17 | 0.37 |
| Andalusia and Canaria Island | 0.28 | 0.40 | 0.26 | 0.44 |
| **Size of municipality** | | | | |
| Less than 10,000 inhabitants | 0.20 | 0.40 | 0.20 | 0.40 |
| More than 10,000 inhabitants | 0.80 | 0.40 | 0.80 | 0.40 |
| **Number of observations** | 977 | | 1,316 | |

**Notes:**
(a) This category include individuals with medium level vocational and technical training
(b) The educational level of higher education is composed by upper level vocational and technical training, short-cycle higher education and long-cycle higher education.
**Source:** Own elaboration from data of Time Use Survey 2009-2010 (INE, 2011).