FAMILY AND EDUCATION: A GENDER APPROACH FOR YOUNG ADULTS AT AGES 16 TO 25 IN SPAIN FROM 2002 TO 2013.

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Abstract

This paper analyzes the education attainment of girls and boys cohabiting with parents aged 16 to 25 in Spain during the period 2002—2013, and focuses on those living in vulnerable households.

Multinomial logit estimates show that the educational attainment of boys is more linked to household characteristics, whereas girls are more self dependent and they concurrently exhibit more efficient educational paths. The treatment of the economic situation provides a new result, which is that successive generations show opposing trends in educational attainment; when parents increase then the children decrease; also, and simultaneously, the preceding generation has a strong positive effect on the subsequent generation

Keywords: intergenerational mobility, assortative mating, vulnerable households.
JEL Codes: I21, J12.

1. Introduction

This paper analyzes the educational attainment of young adults aged 16 to 25 as an intergenerational process; i.e. from parents to daughters and sons. The current big recession is characterized in Spain, and in other European countries, by the collapse of aggregate demand policies and social spending. It is particularly dramatic in education, health and care for dependent people. As a consequence of increasing inequality, the most vulnerable people are placed in a vicious circle that reinforces the role of the family as an insurance against social exclusion[1]. In these circumstances one wonders about young people aged 16 and over, for whom compulsory education ends and working life begins. Our purpose is to explore the post-compulsory educational progress of young people with respect to their family backgrounds and economic situations during 2002-2013; during this period different trends are observed among generations: a decrease for children and a rise for parents.

Given that at this age individuals can remain in or withdraw from the educational system, we pay special attention to educationally disadvantaged students. We refer to those who are likely to experience low educational achievement and years of incomplete schooling because of a lack of appropriate resources in their homes and

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[1] See the recent reports by Oxfam Intermon of January 20th 2014 and the 'Consejo Económico y Social' for 2013, among others. For European comparisons 2003-2012, see General government expenditure by function (COFOG) in Eurostat tables 'gov_a_exp' (last update 20 05 14)

communities. 'Such students are heavily concentrated among minorities, immigrants, single-parent families and families in poverty;' (Levin 1989, p. 52).

The quantity-quality fertility approach (Becker-Lewis 1973, Willis 1973) has opened a window to explore the offspring's education in relation to the socioeconomic status of the family, which is measured by parents' education and income (Becker and Tomes 1986, Behrman and Taubman 1985, Lazear 1983). The survey by Haveman and Wolfe (1995) provides evidence of the positive effect of a parent's education on a child's attainment, after correction by means of family income. It concludes with the general agreement that "the human capital of the mother is usually more closely related to the attainment of the child than is that of the father" (page 1855). Ulterior longitudinal studies (Ermish and Francesconi, 2001, and Currie and Moretti 2003 regarding child health) and cross-sectional research (Cañada 2005, Davis-Kean 2005) confirm this finding.

In recent years new perspectives are emerging and now the results do not have the previous consensus. On the one hand, the institutional approach focuses on changes in compulsory schooling laws in previous decades to identify the effect of the subsequent increase in parental education on children's educational outcomes[2]. Oreopoulos (2003) finds, for the United States of America, an increase in the education of either parent reduces the probability of a child repeating a grade, while Black et al (2005), find, for Norway, there is little causal relationship between the parents' and the child's education, except in the case of mothers and sons; when mothers have increased their educational attainment, sons achieve a higher level of education too. On the other hand, the endowment standpoint draws a contrary conclusion after correcting the biases of genetic inheritance and assortative mating. Behrman and Rosenzweig (2002) use data on monozygotic (MZ) male and female twins and find that, within twin estimates, the mother's schooling effect is marginally negative, while the father's is positive and statistically significant. Plug (2004) uses data on adoptees, and also finds that the association between the mother's, and the child's schooling disappears, but this is not so for the father. Their results are similar, since after correcting the genetic bias the effect of the mother's education remains positive when estimated alone; but disappears after correcting the assortative mating bias by estimating jointly with her husband's education. This is an important new outcome for intergenerational schooling effects, and challenges the common conception that maternal not paternal schooling has a bigger effect on offspring's schooling. Behrman and Rosenzweig (2002) relate this result to home time allocation between spouses, given that time and care by mothers are a key determinant of their children's human capital; furthermore, the women's decisions to invest more in their own education, which includes attracting more educated peers.

The innovation here is the treatment of marital sorting, which is based on pairing parental education levels, in order to circumvent the assortative mating bias. This involves using a set of dummy variables instead of the years of the mother's and

[2] This suggests an exploration of the effect of introducing compulsory education until the age of fourteen by Spain in 1970 by the General Education Law (LGE), and its subsequent extension to sixteen in 1990 by the Law on General Education System Arrangement (LOGSE).

father's education[3]. The study's objective is the education of young adults beyond compulsory school leaving age, so four basic levels are distinguished in both generations: *Edu1* for uncompleted compulsory education; *Edu2* for compulsory (equivalent to 11 years of completed education, from ages 6 to 16); *Edu3* for upper secondary (13 years of completed education); and *Edu4* for higher education (15 or more years of completed education). Table A3 of the Annex presents the equivalence of these categories to the levels of ISCED glossary[4]. In addition, this is a gender based approach, because girls and boys exhibit different timings in the life cycle events that mark transition to maturity; for example the end of schooling, emancipation from the parental home, entry into the labor market, and the formation of a new family.

Unlike the usual linear models, a discrete model of intergenerational mobility is proposed. This is in order to assess the level of completed education of children in terms of pairings by the levels of the parents, their fertility decisions and vulnerability at home. Methods focus on multinomial logit models as being appropriate to estimate the probability of completing each level of education, and estimates were made with Stata 9.

In the absence of other suitable data, we use the individual records of the second quarter of the EPA (Labor Force Survey) in consecutive years from 2002 to 2013. This is a quarterly survey of over 60,000 families and approximately 200,000 individuals, gathered by the INE (Instituto Nacional de Estadística- *National Statistics Institute*). This provides a comprehensive picture of the demographic and labor-related characteristics of all of the members of the household at the time of the survey; however, it omits all monetary information. The EPA has two major limitations, although these are partially alleviated by the use of cross-sectional data from consecutive periods. The first limitation is the impossibility of control by means of parental income; therefore, the estimators for the effect of parental education suffer from a weak upward bias (Haveman Wolfe 1995, Behrman and Rosenzweig 2002, Plug 2004). Secondly, the sample is restricted to young people cohabiting at the parental home; see Cañada (2005), Chevalier (2004) and Ermish and Francesconi (2001).

The rest of the paper is as follows. Section 2 presents the theoretical model and econometric specification. Section 3 pays attention to data. Section 4 presents the results in terms of marginal effects due to the educational level achieved. Section 5 discusses some relevant points. Section 6 contains concluding remarks and proposes further issues.

2. A Discrete Intergenerational Mobility Model and Method of Estimation.

Following the stochastic-linear equation developed by Becker and Tomes (1986), we have applied the following reduced form of a discrete Markov intergenerational mobility model in probability terms:

[3] The habitual approach consists on estimate the correlation among years of schooling of spouses (i.e. Berhman and Rosenzweig 2002, p 328 conclude that 'a women who increases her schooling by one year would actually only attract a mate with less than 0.4 more years of schooling'; and 0.54 more years in Plug 2005, p 362).

[4] Briefly *Edu1* corresponds with ISCED Levels 0 and 1; *Edu2* with Level 2; *Edu3* with Levels 3 and 4; and *Edu4* with Levels 5 and 6.

$$Prob(S_{i,t,k}) = \Theta(\alpha_{t,k} + \sum_{mf=1}^{n} \gamma_{mf,k} S_{i,t-1,mf} + \delta h_{i,t-1} + \mu p_{i,t} + \varepsilon) \qquad (1)$$

for $\forall k(1,..,R)$ being $\Sigma_k Prob(S_{i,t,k})=1$. Where $S_{i,t,k}$ denotes the level of schooling attained k by individual i in generation t which follows the probability distribution function Θ. Vector $S_{i,t-1,mf}$ collects the set of n dummy variables for mf educational pairings of parents (generation t-1), where for each child the number one adopts a position the unit value, and all others $n-1$ zero, h are home endowments. The symbol p is a vector of a child's personal characteristics, and ε measures unsystematic components or luck in the transmission process. Vectors γ, δ and μ respectively contain the intergenerational effect of each parental pairing educationally, the influence of other home endowments and of personal characteristics regarding the children's attainment. The term $\alpha_{t,k}$ can be interpreted as the social endowment common to all members of a given cohort in the same society with regard to the outcome k.

Using Θ as logistic distribution, multinomial logit is the suitable method to estimate this discrete intergenerational approach. In its simplified form, the model (1) assumes the following expression: $S_{i,k}=\Theta(\beta_k' X_i)$ where $S_{i,k}$ denotes that individual i has attained level k of education, X_i is the vector of his/her family and personal characteristics, and β_k is the set of regression coefficients associated with outcome k that evaluate the effect of each of the variables in addition to the constant $\beta_{0,k}$ for social endowment α_k. Then, the probability individual i will be observed at a level k, $P_{i,k}$, is as follows (Greene, 2003) :

$$P_{i,k} = Prob(S_i = k) = \frac{exp(\beta_k' X_i)}{\sum_{r=1}^{R} exp(\beta_r' X_i)}, \; for \; \forall \; k \in R; \qquad (2)$$

being $0 \leq P_{i,k} \leq 1$ and $\Sigma_{k(1 \to R)}=1$ where β'_b vector is a null vector for base category b and then $\exp(\beta'_b X_i)=1$. Since they are estimated by maximum likelihood, β_k vectors of coefficients present some difficulties with interpretation: as they are linked to the base outcome, we cannot be sure that their sign corresponds to the direction of the effect upon the probability of reaching corresponding education level k. In order to circumvent this, we will proceed in terms of the marginal effect $me^{j,k}$ of the different independent variables j $\{1,..,J\}$ upon the outcome k for the representative individual, whose characteristics correspond to the sample mean: $X_i = \overline{X} = (\overline{x_1},...,\overline{x_j},...,\overline{x_J})$. For calculus, such marginal effects depend on the nature of the independent variable (for details see Annex).

3. Data

3.1 The choice of the age group. As previously mentioned, we use the consecutive cross sectional data from the EPA, which only collects data on home cohabitants when conducting surveys. The consequence of this is that the sample is only concerned with

the young adults who cohabit with parents. So, we are dealing with a self-selection sample bias, as the sample loses observations of emancipated youth in a non-random fashion. Under these circumstances, we use the median age of leaving home to determine the cut-off age, because it allows us to retain at least 50% of each cohort in the parental home.

It is worth mentioning three aspects here (see Table A1 of the Annex). First, girls leave the parental home on average two years before than boys, and the difference between the sexes decreases with the educational levels. Second, there is a positive relationship between cohabiting with parents and educational attainment in both genders, since more educated children stay longer with parents. Third, the economic situation also influences the age of emancipation, a countercyclical pattern has been observed in Spain with hysteresis, regardless of gender and level of education. It fell during the boom, between 2002 and 2008, and the first years of the recession, until 2011; then in recent years it moderately rebounded. This data suggests taking 25 as the maximum age for the study, as the median age of leaving home is higher at all levels of education and all years (except in 2008 for *Edu1* where there was no gender differentiation). We are aware that girls and less educated youths of both genders are underrepresented.

Furthermore, we must take into account two other factors: education in Spain is compulsory until 16 years of age; and second, the academic schedule differs from natural years in such a way that the standard examination period is in June. These means that individuals born in the second semester can obtain their graduation diploma in June, one year younger than those born in the first semester. Consequently, we establish a further gap of one more year in age for the latter category; this is in order to give every person the chance to reach the same education level regardless of the month of birth. In summary, given that our goal is to explore educational achievements in the first decade after the minimum school leaving age of sixteen, we focus on the 16 to 25 year old age group for those born in the second semester, and on 17 to 26 year olds for those born in the first semester.

3.2) Dependent variable: educational attainment. As mentioned before, we deal with a four categories of dependent variables *EL4C*, by distinguishing those who have not completed compulsory education (*Edu1*) from those who have done so (*Edu2*) and/or have progressed into upper secondary (*Edu3*) or into tertiary education (*Edu4*). Table 1 presents the evolution of educational attainment separately for girls and boys; it shows the percentage points for each category of the dependent variable of all the years during period 2002-2013 together, but separately for the initial and final years of the observation period, i.e. 2002 and 2013, and also for the downturn year of 2008. These features show that the educational attainment of young people in Spain presents a countercyclical path with hysteresis, as it clearly decreases with the economic expansion from 2002 to 2008, and had not fully recovered by the subsequent recession. This has allowed us to anticipate the higher vulnerability of those who opted for early entry into labor market, to the detriment of their education during the upswing. They will experience greater instability during a downturn.

Table 1
Education Attainment: Categories of Dependent Variable (as a percentage).
Girls and boys between 16 and 25 years old cohabiting at parental home.
Whole period 2002-2013 and the separate years of 2002, 2008 and 2013

Category	Description	2002-13	2002	2008	2013
Girls					
Edu1*	Less than compulsory education	13.83	10.66	15.79	15.30
Edu2*	Compulsory education	29.87	30.80	29.28	29.30
Edu3*	Upper secondary	35.32	36.01	34.55	35.77
Edu4*	Higher education	20.98	22.53	20.37	19.63
Boys					
Edu1*	Less than compulsory education	19.87	14.98	23.16	20.95
Edu2*	Compulsory education	34.95	37.02	32.43	32.10
Edu3*	Upper secondary	30.81	31.63	29.76	32.72
Edu4*	Higher education	14.37	16.37	14.65	14.23

Edu1 (less than the compulsory minimum) exhibits an alarming increase in both genders, rising from 10.66 in 2002 to 15.30 in 2013 with a maximum of 16.67 in 2009 for girls; for boys it increased from 14.98 to 20.95, maximum was 24.54 in 2009. Simultaneously *Edu4* (higher education) fell from 22.53 in 2002 to 19.63 in 2013 with a minimum of 18.71 for girls; however, for their male peers the figures were 16.37, 14.23 and 12.98 for the same period. This underscores the selective nature of the investment process in educational human capital, since school leaving early hampers any subsequent recovery of knowledge and qualities required to reach higher education. Gender comparison shows important differences, since girls invest more in education than boys. For the whole 2002-2013 period there are 46 percent more young women aged 16-25 who have received tertiary education compared to their male peers. Conversely, there are 43 percent more young men aged 16-25, compared to their feminine coequals, who have not completed compulsory education having had the opportunity to do so. These large differences warrant separate treatment by gender.

These figures indicate that we should research the effect of the educational pairings of parents upon the educational outcomes of children. To this end, we will proceed with a set of fourteen dichotomous variables, *EdupXY* (where *X{1,2,3,4}*, *Y{0;1,2,3,4}* and X≥Y), which result from folding the matrix in Table A2 along the main diagonal. There are four dummies for single parents (*EdupX0*), regardless of whether the parent concerned lives with the child; additionally, there are ten for two parent households (*Edup11*; *Edup21*, *Edup22*; *Edup31*; *Edup32*, *Edup33*; *Edup41*; *Edup42*, *Edup43*, *Edup44*), regardless of which parent is in the X or the Y position.

3.3) Independent variables. Table 2 (moved to the Annex for reasons of space) presents the summary statistics of the independent variables, for the entire observation period from 2002 to 2013 and for the years 2002, 2008 and 2013, separately for girls and boys. Sample size denotes the under-representation of girls because, as previously mentioned, daughters leave the parental home two years earlier than sons. According to Model (1) these variables are grouped in four specific sets: individual, home, parents and year. The following comments refer to the magnitudes of the two genders together, since the differences between them are not statically significant.

First, the individual variables concerning age , health precariousness (*Disabled* or *Sick*, in line with Horn and Bobbitt 1999 and Wagner and Blackorby 1996), or origin (Boyd 2002) by differentiating immigrants themselves (*Immigrant*) and native offspring of immigrant parents (*Immig2ndg*). It is worth mentioning here that the increasing presence of direct immigrants at post-compulsory schooling age, changed from 0.009 in 2002 to 0.117 in 2013, following a monotonic increase process; this was particularly intense during the of 2002-2008 expansion, and in the subsequent moderation in the 2008-2013 recession. Second generation immigrants also present a monotonous increasing path, which is slower and not so dependent on the economic situation.

Second and following Levin (1989), the home variables involve paying detailed attention to differentiating the single parent cases, and the other indicators of vulnerability due to economic restrictions; these are considered in terms of the home's unemployment rate as fraction of unemployed over active, *HUR,* and time scarcity linked to the number of other disabled (*Ot-disabled*) and other sick (*Ot-sick*) cohabiting at home. Furthermore, we control the number of other adults (*Ot-adult*, excluded parents, and siblings), as well as residential mobility (*Rmobility*) as a proxy of inner migrations through changing the municipality of residence over the last year. The number of disabled and sick at home present an opposite evolution that may be, at least partially related, to the Dependence Act of 2008, which is concerned with family strategies regarding transferring administratively from sick to disabled situations; thus, *Ot-sick* decreases from 0.113 to 0.076 in 2013, whereas *Ot-disabled* increases from 0,087 to 0.1. It is worth mentioning here that the dramatic increase in the risk of falling monetary resources during the recession is shown by the home unemployment rate *HUR*, which rose from 0.124 in 2008 to 0.302 in 2013. The ∩ profile of *Rmobility,* with a maximum in 2008, points to the economic background of this decision, and its low level simultaneously suggests residential rigidity in Spain.

Third, parents' information concerns their education and the other variables related to fertility decisions. These are the number of siblings and composition of older and younger siblings (*O-sibling, Y-sibling*) , whose expected effect is negative, according to the quantity-quality model. The female sibling environment is given by the percentage of sister siblings (*%sisters*). This is carried out in order to capture the differentiation of gender roles within the household. The expected effect is positive, because the hypothesis is that daughters assume more tasks, responsibilities, and develop more collective values such as solidarity than sons do. The decreasing number of siblings throughout the observation period reflects the fall of fertility in Spain, and *%sisters* is significantly lower than 50 percent; this is because it assesses the proportion of sisters among other siblings (excluding the person who is the subject, so it takes a value of zero for an only child)[5]. Furthermore, and in order to take into account mother specific human capital, we control the difference in age between mother and child by distinguishing the tails of the distribution of their ages at birth for cases of early and late motherhood, *Meab* and *Mlab* respectively. These depend on whether the difference

[5] It is worth mentioning here that *%sisters* is significantly higher for girls than boys. We have no explanation for this fact, beyond the conjecture that for each pair man-woman the gender of their children is determined by a random mechanism biased by their own genetic disposition towards either gender.

in age between mother and child is less than 21 or greater than 40 years. The ∩ profile of mothers' early age at birth (*Meab*) can be attributed to the quantum leap in sexual and reproductive education, and its inclusion in the National Health Service system in the second half of the 1980s. You will note that *Meab* mothers in 2002 were born between 1977 and 1986, their peers of 2013 between 1988 and 1997.

As mentioned above, the approach to parents' education differs from the related bibliography, since we focus on pairing education levels. Our reason for setting out fourteen variables is twofold. The first is: to evaluate the effect of the parents' education; the second to identify to what extent differences among parents influence the results of children, regardless whether the mother or father has more education. Furthermore, we control the vocational formation in at least one parent (*Vocp*) The figures here show a significant increase in adult education, since the fraction of households with no parent who reaches compulsory education (*Edup10+Edup11*) falls from 0.455 in 2002 to 0.173 in 2013; however, the fraction where at least one parent has tertiary education (*Edup40+Edup41+ Edup42+Edup43+ Edup44*) rises from 0.196 to 0.317 for the same periods. The differences in the evolution of education between generations progress in parents versus moderate regression in offspring, are the result of early school leavers in the expansionary phase between 2002 and 2008. This expansionary phase was based on low-skilled employment, mainly in construction and retail, and these differences present two aspects of interest. On the one hand, they contradict the conventional wisdom that an increase in parental education is associated with an increase in the education of children; on the other hand, they reinforce the role of the family as a refuge during the recession.

It is worth mentioning here that the young who cohabit in single-parent households correspond to the sum of *Edup10+Edup20+Edup30+Edup40;* and this shows the monotonous increase of the percentage jump from 15.2 in 2002 to 22.9 in 2013[6]. The comparison of single-parent and two-parent effects (*Edup10* vs. *Edup11; Edup20* vs. *Edup21*and *Edup22*, and so on) provides an indicator of educational disadvantages for single parent children.

Finally, the economic situation is controlled by means of the eleven year dummies *Y03-Y13*, although *Y02* has been omitted. The slow and monotonic descending trend of the yearly sample weight verifies the downward trend in the birth rate, as noted above.

4. Education Attainment of the Young who Cohabit the Parental Home.

Due to space restrictions, this section concentrates on the presentation of results for the entire period 2002-2013[7]. Table 3 (moved to the Annex for reasons of space) presents, separately for girls and boys, the marginal effects on the probability of achieving each of the four targeted levels of education, which corresponds to multinomial logit estimates.

Personal variables. We find the exclusion from post-compulsory education level of vulnerable young adults, which is consistent with the aforementioned international

[6] It is important to relate this monotonous path with the Divorce Act of 1981, whose effects continue to expand and society has not yet reached a stable situation at this point.

[7] Results for separate years, and for pseudo cohorts aged 16-25 from 2002 to 2011, from 2003 to 2012 and from 2004 to 2013 are available upon request.

results. Disabled support is a dramatic barrier that hurts more girls (their additional likelihood of staying at *Edu1* is 0.660 vs. 0.569 for boys). It is the same but with less intensity for those who suffer from fragile health (0.253 lower probability of reaching post-compulsory levels: -0187 for *Edu3* and -0.066 for *Edu4* for girls, and -0.207, -0.162 and -0045 respectively for boys). The marginal effects for young immigrants show the additional difficulties with educational progress, and the probability of completing post compulsory education is also lower for girls (-0.171 corresponds to -0.078 to *Edu3* and -0.093 to *Edu4*) than boys (-0.120, 0.072 and -0.048 for the same circumstances). Although attenuated, the barriers to post-compulsory education persist in second-generation immigrants, and again girls more greatly affected (-0.049 for vs.-0.032 in boys for *Edu4;* and no significant effect on either gender for *Edu3*). Therefore, girls are more negatively affected by all the individual factors of educational disadvantage that we evaluate in this paper. By way of conjecture, this evidence suggests that the opportunity cost of studying in difficult conditions exceeds the expected returns during the lifecycle; this is due largely to discrimination and the occupational segregation that they suffer both as women and by having disadvantaged origins.

Home variables. Looking in greater depth at disadvantaged people, the marginal effects for home vulnerability variables have the expected sign. The *HUR*, *Ot-disabled* and *Ot-sick*[8] show that the more severe the restrictions at home, then the greater difficulties the children's the educational progress; this generates a vicious circle for generations which hurts boys more than girls (i.e. *HUR*, *Ot-disabled* and *Ot-sick* increase the likely to fix boys at *Edu1* by 0.099, 0.032 and 0.032 respectively, while the same figures for girls are 0.058, 0.13 and 0.23).. It is worth mentioning that this is the case for *HUR,* since the home unemployment rate increases dramatically (see Table 2) and therefore the barrier to post-compulsory education increases by 0.021 for a representative girl and 0.025 for her coequal boy. Household residential mobility appears as a positive factor in the educational attainment of the children, whose probability of completing post-compulsory levels increases 0.108 for girls (+0.073 for *Edu3* and +0.033 for *Edu4*) and 0.170 for boys (+0.120 for *Edu3* and +0.050 for *Edu4*); this suggests that inner migrations have a place in educational improvement. Briefly, home variables run contrary to what was observed by the personal variables analyzed above, affecting more boys than girls.

Fertility variables: The marginal effect of the number of siblings shows the expected income effect of distributing the available resources among more individuals, which is in turn associated with lower educational attainment by both older and younger siblings, with no significant differences among girls and boys (-0.017 at *O-sibling* and -0.017 at *Y-sibling* vs.-0.006 and -0.017 for boys in *Edu4*). The female ambiance among siblings provides a helpful effect, which is linked to cooperative behavior by girls more than boys; this implies a 0.040 additional likelihood of girls reaching post compulsory education (+0.026 for Edu3 and +0.014 for Edu4), and 0.034 for boys (+0.034 for Edu3 and no effect for Edu4). Mother age at birth is also a heterogeneous factor for children's education. Early mothers (*Meab*) exhibit a lower

[8] Notify that the variables *HUR*, *Ot-disabled* and *Ot-sick* point to home vulnerability in terms of likelihood, since the only refer to the current situation at and do not state anything about the past.

capacity to drive their offspring to post-compulsory attainment (-0.075 and -0.044 for *Edu3* and *Edu4* in for daughters, and -0.091 and -0.41 for sons). However, there is no significant effect for late motherhood (*Mlab*).

Joint analysis of this and previous evidence allows us to assert that the educational attainment of girls is more attached to their own characteristics, while boys are more dependent on home characteristics.

Pairing parents' education: The reference group is the two-parent households where no parent finishes compulsory education (*Edup11*). The set of parents' education variables confirm three relevant results. First, there is a strong positive influence on the educational attainment of children; second, there exists a disadvantage of cohabiting with a single-parent; and third, the positive intergenerational effect exhibits different profiles in daughters and sons. In single parent households, there is no gender difference in *Edu4* for offspring of *Edup30* and *Edup40* (+0.045 and +0.110 respectively for both daughters and sons). Nevertheless, sons benefit significantly more in *Edu3* from *Edup30* and *Edup40* (+0.212 and +0.254 versus +0.160 and + 0.161 in daughters). In two parents families girls benefit moderately more than boys from assortative mating with regard to higher education (+0.163 versus +0.136 with *Edup43* and +0.185 Vs +0.176 with *Edup44*); moreover, improvements in boys is also concentrated on *Edu3* (+0.255 versus +0.154 in girls from *Edup33* and +0.278 Vs +0.133 from *Edup44*). A comparison by family type highlights the importance of two parents in the home, since the effect on *Edu4* from a single parent *Edup40* (+0.110 in girls and boys) is similar to two parents with maximum gap *Edup41* (+0.111 in girls and +0.118 in boys); it is significantly lower than assortative mating *Edup44* (+0.185 in girls and +0.176 in boys). In summary, and according to the quantity-quality model, those who grow up in a single parent home are worse off than their counterparts in two-parent homes, all other things being equal.

Figures for parents with vocational training (*Vocp*) demonstrate a negative influence on the educational progress of their children, particularly in the case of sons, since they suffer a -0.078 lower probability of completing post compulsory education (-0.067 and -0.011 for *Edu3* and *Edu4*), whereas the barrier of daughters is -0.056 (-0.040 and -0.016 for *Edu3* and *Edu4*). These results require a more detailed analysis, in order to identify to what extent this disadvantaged situation may be related to the repetition of the educational pattern from one generation to the next. The question here is whether parents with vocational training are more likely to have children with the same educational profile.

Economic situation. The effect of economic situation is approached by dummies for separate years, and demonstrates the negative pairing between the economic growth and the scholarly effort of the young. This is a counter-cyclical behavior with hysteresis, since the probability of *Edu1* increased monotonically along the expansive phase from 2002 to 2008 to reach its peak in 2010 for girls (0.051) and in 2009 for boys (0.130); and then in 2013 it fell in both genders to the 2006-2007 levels (0.035 for girls and 0.088 for boys). Conversely, there was the expulsion from post-compulsory levels by the expansion and the moderate return during recession, since in 2013 the likely of post-compulsory education as it was in 2004 has recovered. (*Edu3*+*Edu4*=-0.027-0.017=-0.044 for girls and =-0.037-0.019=-0.056 for boys). These figures show, in both genders and in particular in boys, the attractiveness of the labor market during the boom to the detriment of their education, and a slow return to school in the

recession. Given that early school leaving is associated with precarious temporary and low-skilled employment, these results are consistent with the hypothesis of myopia among young people, which is expressed by a strong preference for the present at the expense of the future; and therefore there is a tendency for young people to under-invest in their own education in boom times.

Taken together, these results highlight the dramatic vulnerability of disadvantaged households, and suggest the need to strengthen social policies so as to encourage investment in human capital of young people concerned. This is necessary in order to control the increasing dynamics of social exclusion that accompany the current recession.

5. Discussion.

Since in general terms these results are in accordance with quantity-quality models and socioeconomic approaches to vulnerable families, we will focus here on two particular features of this paper.

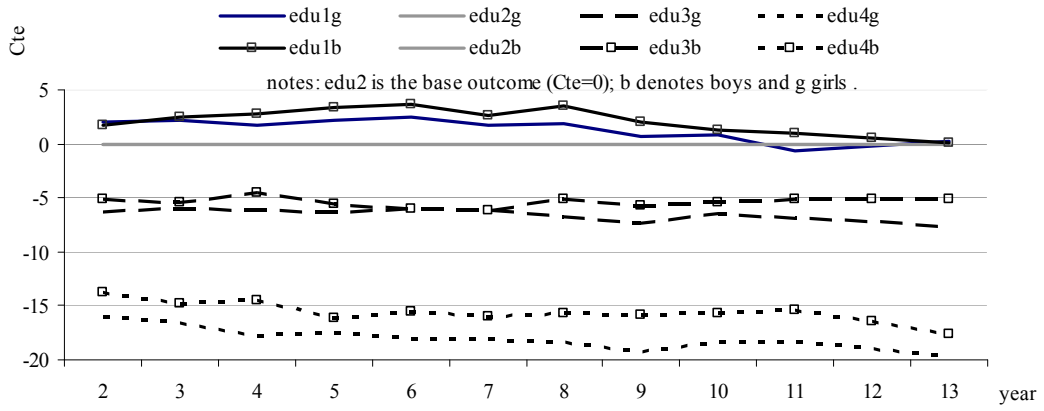
First, the purpose of differentiating between older and younger siblings is to consider the result by Zajonc (1976), subsequently confirmed by Behrman and Taubman (1986), which emphasizes that older siblings have better educational outcomes than younger siblings. While the criticism by Griliches (1986) suggests that this is a statistical effect, since older school-age children are more likely to have completed longer programs and have had more time to do so; this is not because they are more capable, receive better care or more family resources than their younger siblings.

The finding here is that both younger and older siblings negatively influence educational attainment and that younger harm more than older, which contradicts the original hypothesis and ratifies Griliches criticism. In a pedagogical context, the greater negative effect of younger brothers suggests that children benefit more from learning from older siblings rather than teaching to younger brothers and sisters, while the economic analysis indicates decreasing returns to scale on parental investment in children. Furthermore, the positive and significant effect of a female sibling ambiance upon both genders verifies the original result by Butcher and Case (1994) for girls, and it is then generalized for boys; however, the intensity in our paper is significantly higher in girls than in boys. As for Spain, these findings are consistent with Cañada (2005), who estimates the age of leaving educational system in 2000 also using the cross sectional data from the EPA.

Secondly and more importantly, parents with higher level of education have children with higher educational levels. This common result of the intergenerational transmission is confirmed. However, the approach to the economic situation reveals opposite trends in the education of parents (increasing) and children (decreasing), along with a strong positive and significant intergenerational effect. This finding disagrees with the institutional analyses which evaluate, from a secular perspective, the incidence of increasing education of the generation of parents upon the next generation (Black el all 2005, Goldin 1997, and Oreopoulos 2003 among others). In order to explore this phenomenon in greater depth a complementary approach can be made by analyzing the evolution over the period 2002-2013. Becker and Tomes (1986) note that the constant α in Model (1) reflects the social endowment effect upon children's

education. In their linear two variables model, the stationary state (α=cte, and γ=cte<1) the Markov chain for a representative child converge at Lim $S^i_t=\alpha/(1-\gamma)$; this is $1/(1-\gamma)$ times the average social endowment effect on education at the beginning of the process. Here Markov expansion is different, since our discrete approach estimates the probability of completing each level of education, with the constraint that the sum of these probabilities is unity. Given that the constant of estimation has not marginal effect by definition, we must work with estimated constant for each education level ($\beta_{0,k}$. in expression 2).

Figure 1
Evolution 2002-2013 in girls and boys of the constant of estimation by education level



Thus, Figure 1 shows the evolution 2002-2013 for girls and boys separately from the constant for the outcomes of *Edu1*, *Edu3* and *Edu4,* which referred to *Edu2* as the base outcome. Here we appreciate that the constant for *Edu1* presents a positive and pro-cyclical profile that is more intense for boys than for girls, which reveals that the social environment facilitates early school leaving and encourages more boys than girls. Regarding *Edu4*, we verify a counter cyclical trend in both genders, with a reduction during expansion and flat during recession, which confirms the previous result in terms of barriers to higher education. The gender comparison reveals that social conditions for higher education are worse for girls than for boys, suggesting that here too women suffer from discrimination; or at least they start from a disadvantage, and yet invest more on education than men.

6. Concluding Remarks.

This paper utilizes a discrete intergenerational model to analyze the effects of the family in the educational attainment of cohabiting girls and boys aged between 16 and 25 in Spain during the period 2002-2013. It pays particular attention to situations of vulnerability that are attributable both to the people themselves as family externalities. Examples are the disabled or poor health, immigrants, those living with a single parent or in impoverished households and with a low educational level. Also taken into account the impact of fertility decisions of parents in terms of the mother's age at birth, number of brothers and sisters, their position within the birth order or the ratio of

sisters within the siblings. These are variables that also involve significant heterogeneity, according to the quantity-quality fertility approach.

Parental education is always beneficial to the educational attainment of children. In the case of the young cohabiting with both parents, the importance of matching the same educational level of both parents is found as the difference of levels between them is accompanied by a fall in the children's probability of achieving post-compulsory levels of *Edu3* and *Edu,4;* this increases with the level of gap between parents.

Comparing the figures for boys and girls, it is found that all the variables have the same sign and a similar statistical significance, which suggests the robustness of the effects. The detailed analysis shows that girls are more adversely affected by the factors of personal handicaps and single parenthood, and the boys by low parental education and the conditions of disadvantaged households: this is an important finding in that girls' educational attainment depends more on themselves, while that of boys is more attached to home characteristics. The intergenerational virtuous circle of education shows a significant difference in both genders: the girls are given stronger stimuli in higher education, but for boys this happens in high school. Thus, girls exhibit more efficient educational paths, as they have a greater probability of reaching higher education.

The monitoring of the economic situation highlights the counter-cyclical profile of educational attainment for young people. This is reduced in the expansionary phase of the cycle 2002-2008, and strong hysteresis delays the recovery in the subsequent recession. This explains the increase in the population that remains in the educational system without the resulting increase in graduate numbers at each level in 2013. However, at this point, the most important finding is the lack of harmony in the evolution of education for both generations; for example, the parents' increases and children's decreases as a result of the economic situation. For a provisional approximation, we explore the contents of social endowment for the constant of estimation β_{0k} for the separate education levels. We verify they have an opposite yearly evolution due to contributions from *Edu1* (pro-cyclical) and *Edu4* (countercyclical).

Taken together, these results highlight the dramatic vulnerability of disadvantaged people, and suggest the need to strengthen social policies to encourage investment in the human capital of the young people concerned. This is a means of controlling both the increasing dynamics of social exclusion for less educated youths, and the loss of incentives to progress to higher levels that have accompanied the current recession.

These results, and in particular the following three, open up new opportunities for analysis. Firstly, they deepen the analysis of the differences between girls and boys for the same four educational levels. The purpose here is to quantify the effects of, allocation, valuation, as well as the impact of the social environment as collated by the constant of estimation. This is achieved by using Yun's (2004) generalization of the Oaxaca-Blinder decomposition method. Secondly, at an educational level, distinguish those who have left the school system from those who stay on. This distinction is important, because the range of analyzed ages corresponds to post-compulsory schooling in order to shed light on those exogenous variables associated with early neglect and on those favoring permanence and progress in education. Thirdly, in post-compulsory educational levels, they differentiate vocational training from general education. This identifies the extent to which these two separate educational pathways are repeated through the generations.

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ANNEX

Table 2 and Table 3 have been moved to this ANNEX because of space reasons.

Table 2
Summary Statistics for Independent Variables by Gender.
Young adults aged 16 to 25 cohabiting with parents. Whole period 2002-2013 and separate years of 2002, 2008 and 2011.

		Girls				Boys			
Variable	Description (* for dichotomous variable; =0 otherwise)	2002-13	2002	2008	2013	2002-13	2002	2008	2013
Age	**Age of the person**	**20.90**	**21.07**	**20.81**	**20.70**	**21.08**	**21.19**	**21.03**	**20.91**
	Standard error	*2.815*	*2.692*	*2.837*	*2.825*	*2.887*	*2.715*	*2.935*	*2.871*
Disabled*	=1 if the individual is disabled	0.008	0.008	0.008	0.011	0.010	0.008	0.012	0.012
Sick*	=1 if the individual is sick	0.011	0.006	0.015	0.010	0.015	0.013	0.018	0.008
Immigrant*	=1 if the individual is of foreign origin	0.068	0.009	0.093	0.119	0.072	0.009	0.098	0.116
Immig2g*	=1 if native offspring of immigrant	0.010	0.003	0.011	0.026	0.010	0.004	0.011	0.028
HUR	Unemployed rate at home (nºunemployed/nºactive)	0.157	0.130	0.122	0.293	0.158	0.114	0.125	0.311
	Standard error	*0.268*	*0.234*	*0.233*	*0.347*	*0.273*	*0.222*	*0.243*	*0.357*
Ot-disabled	Nº of disabled cohabiting, excluded the person	0.087	0.078	0.090	0.097	0.087	0.075	0.085	0.102
	Standard error	*0.297*	*0.271*	*0.308*	*0.313*	*0.306*	*0.273*	*0.308*	*0.325*
Ot-sick	Nº of sick at home, excluded the person	0.094	0.076	0.106	0.075	0.097	0.086	0.120	0.077
	Standard error	*0.302*	*0.263*	*0.323*	*0.268*	*0.313*	*0.281*	*0.351*	*0.278*
Ot-adult	Adults at home (excluded parent and offspring)	0.189	0.147	0.224	0.201	0.188	0.138	0.216	0.208
	Standard error	*0.519*	*0.415*	*0.596*	*0.529*	*0.525*	*0.403*	*0.589*	*0.537*
Rmobility*	=1 if residential mobility during last twelve months	0.015	0.005	0.020	0.015	0.014	0.005	0.017	0.013
O-sibling	Nº of siblings older than the person cohabiting	1.476	1.601	1.427	1.385	1.471	1.590	1.421	1.381
	Standard error	*0.723*	*0.754*	*0.707*	*0.678*	*0.741*	*0.766*	*0.716*	*0.684*
Y-sibling	Nº of siblings younger than the person living	0.689	0.743	0.679	0.657	0.680	0.731	0.671	0.647
	Standard error	*0.854*	*0.826*	*0.901*	*0.865*	*0.865*	*0.811*	*0.909*	*0.857*
%sisters	Fraction of sisters/siblings excluding person	0.360	0.388	0.345	0.341	0.202	0.224	0.194	0.190
	Standard error	*0.430*	*0.408*	*0.434*	*0.440*	*0.242*	*0.234*	*0.245*	*0.242*

Meab*	=1 if <21 years difference in age mother and child	0.070	0.070	0.077	0.063	0.072	0.070	0.076	0.065
Mlab*	=1 if >40 years difference in age mother child	0.021	0.026	0.020	0.017	0.021	0.026	0.017	0.018
Edup10*	=1 if single parent with Edu1	0.065	0.075	0.065	0.058	0.069	0.078	0.066	0.051
Edup20*	=1 if single parent with Edu2	0.048	0.030	0.056	0.062	0.046	0.030	0.049	0.070
Edup30*	=1 if single parent with Edu3	0.041	0.023	0.046	0.063	0.040	0.022	0.046	0.058
Edup40*	=1 if single parent with Edu4	0.034	0.023	0.035	0.049	0.034	0.022	0.038	0.048
Edup11	=1 if both parents with Edu1 (reference group)	0.231	0.378	0.189	0.111	0.238	0.379	0.199	0.119
Edup21*	=1 if one parent with Edu2 and the other with Edu1	0.088	0.076	0.095	0.073	0.089	0.085	0.091	0.079
Edup22*	=1 if both parents with Edu2	0.113	0.092	0.122	0.128	0.113	0.089	0.120	0.128
Edup31*	=1 if one parent with Edu3 and the other with Edu1	0.050	0.055	0.047	0.035	0.047	0.050	0.045	0.034
Edup32*	=1 if one parent with Edu3 and the other with Edu2	0.070	0.045	0.072	0.085	0.067	0.043	0.075	0.088
Edup33*	=1 if both parents with Edu3	0.048	0.032	0.054	0.057	0.047	0.029	0.056	0.060
Edup41*	=1 if ne parent with Edu4 and the other with Edu1	0.025	0.034	0.023	0.018	0.025	0.036	0.021	0.017
Edup42*	=1 if one parent with Edu4 and the other with Edu2	0.042	0.030	0.039	0.064	0.040	0.031	0.045	0.050
Edup43*	=1 if one parent with Edu4 and the other with Edu3	0.067	0.050	0.068	0.094	0.065	0.047	0.068	0.084
Edup44*	=1 if both parents with Edu4	0.081	0.057	0.089	0.104	0.079	0.058	0.081	0.109
Vocp*	=1 if vocational training, at least one parent	0.178	0.119	0.192	0.252	0.173	0.115	0.196	0.233
y2002*	=1 if year 2002 (reference group)	0.106	1			0.102	1		
y2003*	=1 if year 2003	0.101				0.099			
y2004*	=1 if year 2004	0.097				0.094			
y2005*	=1 if year 2005	0.095				0.096			
y2006*	=1 if year 2006	0.091				0.092			
y2007*	=1 if year 2007	0.089				0.090			
y2008*	=1 if year 2008	0.087		1		0.089		1	
y2009*	=1 if year 2009	0.085				0.087			
y2010*	=1 if year 2010	0.085				0.086			
y2011*	=1 if year 2011	0.083				0.085			
y2013*	=1 if year 2013	0.081			1	0.081			1
Nº observac		96444	11122	8174	7606	106664	11954	9157	8495

Table 3
Marginal effects for girls and boys on the probability of levels of educational attainment
Multinomial logit estimations for young adults 16 to 25 cohabiting with parents. Spain 2002-2013..

	Girls						Boys					
	edu1		edu3		edu4		edu1		edu3		edu4	
	me	*t*	me	*t*	me	*t*	me	*t*	me	*t*	me	*t*
Age	-0.029	*64.45*	0.039	*41.16*	0.068	*93.96*	-0.038	*71.78*	0.044	*54.34*	0.039	*77.11*
Disabled*	0.661	*27.62*	-0.404	*34.73*	-0.116	*46.53*	0.569	*30.48*	-0.308	*38.31*	-0.071	*35.62*
Sick*	0.158	*8.33*	-0.187	*9.44*	-0.066	*8.55*	0.150	*9.80*	-0.162	*11.71*	-0.045	*11.24*
Immigrant*	0.085	*9.34*	-0.077	*5.28*	-0.093	*21.21*	0.085	*9.00*	-0.072	*6.22*	-0.048	*12.02*
Immig2g*	0.026	*1.99*	-0.010	*0.37*	-0.049	*3.60*	0.035	*1.89*	-0.027	*1.12*	-0.032	*4.13*
HUR	0.058	*16.88*	-0.091	*10.44*	-0.031	*6.22*	0.099	*20.59*	-0.116	*13.52*	-0.022	*5.98*
Ot-disabled	0.013	*4.44*	-0.022	*3.18*	-0.019	*4.64*	0.032	*7.94*	-0.030	*4.59*	-0.016	*5.67*
Ot-sick	0.023	*7.95*	-0.033	*4.74*	-0.017	*4.06*	0.037	*9.59*	-0.052	*7.83*	-0.017	*5.90*
Ot-adult	0.009	*4.46*	-0.017	*3.54*	-0.016	*5.49*	0.009	*3.11*	-0.008	*1.71*	-0.004	*2.08*
Rmobility*	-0.024	*2.78*	0.075	*3.65*	0.033	*2.83*	-0.048	*4.05*	0.121	*5.75*	0.051	*4.81*
O-sibling	0.017	*12.19*	-0.020	*6.33*	-0.017	*8.63*	0.020	*9.22*	-0.019	*6.01*	-0.006	*4.23*
Y-sibling	0.024	*17.86*	-0.039	*12.66*	-0.023	*13.72*	0.029	*16.44*	-0.032	*11.32*	-0.013	*11.07*
%sisters	-0.018	*7.04*	0.026	*5.18*	0.014	*4.78*	-0.020	*3.31*	0.034	*3.80*	0.004	*1.04*
Meab*	0.049	*8.73*	-0.075	*7.63*	-0.044	*9.94*	0.081	*11.56*	-0.091	*10.86*	-0.041	*16.39*
Mlab*	-0.011	*1.73*	0.035	*2.25*	-0.012	*1.32*	-0.011	*1.33*	0.010	*0.72*	0.009	*1.42*
Edup10*	0.035	*6.88*	-0.056	*5.00*	-0.049	*11.10*	0.038	*6.02*	-0.039	*3.87*	-0.020	*5.72*
Edup20*	-0.032	*10.54*	0.036	*3.14*	0.014	*1.85*	-0.053	*11.52*	0.045	*3.91*	0.008	*1.31*
Edup30*	-0.060	*24.96*	0.160	*13.42*	0.045	*4.79*	-0.111	*34.47*	0.212	*17.10*	0.045	*5.71*
Edup40*	-0.070	*35.18*	0.161	*13.03*	0.110	*9.41*	-0.131	*48.15*	0.254	*21.15*	0.110	*10.80*
Edup21*	-0.034	*14.41*	0.061	*7.22*	0.023	*4.02*	-0.051	*14.43*	0.044	*5.24*	0.031	*6.81*
Edup22*	-0.052	*24.63*	0.083	*10.65*	0.054	*9.03*	-0.095	*34.26*	0.105	*13.12*	0.038	*8.09*
Edup31*	-0.057	*24.16*	0.132	*12.75*	0.077	*8.53*	-0.101	*28.40*	0.208	*19.51*	0.058	*8.52*
Edup32*	-0.068	*34.67*	0.121	*13.07*	0.089	*10.87*	-0.127	*50.73*	0.204	*21.77*	0.095	*13.25*

Edup33*	-0.074	*38.29*	0.154	*13.47*	0.121	*11.15*	-0.140	*60.54*	0.255	*23.11*	0.104	*11.58*
Edup41*	-0.063	*27.08*	0.127	*9.94*	0.111	*9.49*	-0.123	*40.39*	0.229	*17.55*	0.118	*11.37*
Edup42*	-0.075	*40.60*	0.115	*10.37*	0.140	*13.23*	-0.137	*60.02*	0.232	*21.09*	0.136	*14.21*
Edup43*	-0.081	*43.73*	0.129	*13.13*	0.163	*17.27*	-0.156	*76.17*	0.277	*29.91*	0.136	*17.35*
Edup44*	-0.089	*49.56*	0.132	*14.80*	0.185	*21.38*	-0.170	*85.68*	0.278	*32.46*	0.176	*23.13*
Vocp*	0.023	*4.91*	-0.040	*6.24*	-0.016	*4.81*	0.043	*7.22*	-0.067	*12.16*	-0.011	*5.12*
y2003*	0.004	*0.80*	-0.018	*2.09*	-0.010	*2.11*	0.021	*3.32*	-0.031	*3.92*	-0.005	*1.55*
y2004*	0.012	*2.57*	-0.027	*3.05*	-0.016	*3.29*	0.033	*5.02*	-0.041	*5.08*	-0.015	*4.75*
y2005*	0.026	*4.51*	-0.037	*3.91*	-0.016	*3.13*	0.056	*7.35*	-0.056	*6.64*	-0.020	*6.60*
y2006*	0.029	*4.90*	-0.022	*2.23*	-0.014	*2.76*	0.085	*10.46*	-0.067	*8.10*	-0.024	*8.13*
y2007*	0.041	*6.52*	-0.046	*4.77*	-0.022	*4.54*	0.097	*11.39*	-0.062	*7.36*	-0.023	*7.57*
y2008*	0.047	*7.16*	-0.038	*3.86*	-0.012	*2.37*	0.124	*13.89*	-0.073	*8.65*	-0.019	*6.13*
y2009*	0.048	*7.19*	-0.031	*3.04*	-0.022	*4.32*	0.130	*13.73*	-0.072	*8.13*	-0.026	*8.71*
y2010*	0.051	*7.23*	-0.030	*3.03*	-0.014	*2.55*	0.110	*12.08*	-0.061	*6.77*	-0.027	*9.23*
y2011*	0.045	*6.37*	-0.030	*2.87*	-0.010	*1.86*	0.106	*11.37*	-0.045	*4.80*	-0.029	*9.95*
y2013*	0.035	*5.17*	-0.027	*2.55*	-0.017	*3.24*	0.088	*9.43*	-0.037	*3.87*	-0.019	*5.75*

Notes:*: Edu2* figures have been excluded because they can be computed directly given that the sum of marginal effects for the four outcomes is zero by definition. Full results can be provided upon reuest. The multinomial logit results are given in Table A4; *me* stands for marginal effect, * denotes dummy variable whose marginal effect was calculated according to the expression (A2); other variables are treated as continuous and differentiable, and their marginal effects were calculated according to the expression (A1); *Absolute value of t-statistic,* $|t|$*, in italic letters*. Confidence intervals: 99.9% for $|t| \geq 3.26$; *b*, 99% for $3.26 \geq |t| \geq 2.58$; 95% for $2.58 \geq \geq |t| \geq 1.96$; 90% for $1.96 \geq |t| \geq 1.65$. These intervals respectively report levels of significance of 0.1%, 1%, 5% and 10%.

Marginal effects. It is worth mentioning here that the calculus of marginal effects depend on the nature continuous vs. discrete of the independent variable Continuous and derivative variables *j* $me^{j,k}$ are reported by the density function of $\overline{x_j}$ on *k*.

$$me^{j,k} = \frac{\partial P_k(\overline{X})}{\partial \overline{x_j}} = \beta_{j,k} P_k - \sum_{r=1}^{R} \frac{\beta_{j,r} P_r}{\sum_{r=1}^{R} \exp(\beta_r' \overline{X})}; \; with \quad \sum_{r=1}^{R} me^{j,k} = 0 \qquad (A1)$$

For dummy variables *j* (growing up in single parent home 1; elsewhere 0), the marginal effect on alternative *k* $me^{j,k}$ is reported by the difference on the probability of completed education level *k* corresponding to the positions 1 and 0.

$$me^{j,k} = P_k(\overline{X} \mid \overline{x_j} = 1) - P_k(\overline{X} \mid \overline{x_j} = 0) \; ; with \sum_{k=1}^{R} me^{j,k} = 0 \qquad (A2)$$

Table A1:
Median of emancipation age by gender and completed education level: Spain 2002, 2008 and 2013

gender	Both gender			Women			Men		
Year	2002	2008	2013	2002	2008	2013	2002	2008	2013
All EL	28.5	27.1	27.1	27.7	26.0	26.5	29.6	27.8	28.5
Edu1	27.2	24.3	26.3	24.8	22.3	22.6	28.3	25.4	27.5
Edu2	27.3	26.3	26.6	25.1	22.8	24.6	29.0	27.4	27.9
Edu3	28.4	25.8	26.5	26.9	24.9	25.7	29.1	27.4	27.8
Edu4	29.4	28.2	28.5	28.6	27.6	27.2	30.0	29.2	29.4

Pairing the education levels of parents. Table A2 presents the education levels of the mother (*edumX*) and father (*edufX*) in five positions of X {0; 1,2,3,4} where the values (1,2,3,4) denote to the previous levels, and the value 0 denotes no information on that parent, and corresponds to a single parent household where child grows-up with the opposite gender parent; i.e. *edum0* means no information available for the mother and thus child cohabits with the father.

Cross analysis of the data for the mother and the father shows in two parent households the most frequent scenario is that the pairings have the same educational level (main diagonal; gray color). The summary matrices for mother (on the right) and father (below) show that matches between the equally educated dominate at lower education levels (73.7 and 75.2 percent for *Edum1* and *Eduf1*, respectively). This means lowly educated people within the parents' generation have very low mobility, and the result is a

vicious circle leading to the social exclusion of these families. At the other extreme, the highest educational mismatches occur in upper secondary education, where a third is paired with the same level (32.9 and 35.2 percent for *Edum3* and *Eduf3*, respectively) and the attraction of a more educated spouse is generally greater for women then for men (30.2 vs. 17.1). This situation also occurs at other levels, although with more moderate values (26.8 vs. 24.8 percent for *Edum1* and *Eduf1*, and 29.0 vs. 21.6 percent for *Edum2* and *Eduf2*, respectively). Figures for higher education point in the same direction, since wives exhibit higher peer pairings (64.5 vs. 47.7 for *Edum4* and *Eduf4*, respectively). Conversely, less well educated husbands are more infrequent (35.5 vs. 52.3 for *Edum4* and *Eduf4*, respectively).

The additional vectors of Edum0 and Eduf0 refer to the absence of information for the mother and father, respectively, which means we deal with single parent households where the child lives with a parent of the other gender (with father for *Edum0* and with mother for *Eduf0*). It is worth mentioning two points here: single parent children account for up to 19 percent of the sample, and live principally with the mother (15.5 vs. 3.3); secondly, the incidence of single mothers decreases with the level of education (0.35, 0.26, 0.22 and 0.17 for *Edum1*, *Edum2*, *Edum3* and *Edum4* respectively), whereas fathers exhibit a step-U profile (0.39, 0.21, 0.18 and 0.22 for *Eduf1*, *Eduf2*, *Eduf3* and *Eduf4* respectively*)*.

Table A2
Marital sorting in Spain
Education level of mother and father as a percentage. Whole period 2002-2013

father→							Tph: mother summary			
mother↓	Eduf1	Eduf2	Eduf3	Eduf4	Eduf0	Total	m<f	m=f	m>f	total
Edum1	23.45	4.20	2.48	1.68	5.40	37.21	26.28	73.72		100
Edum2	4.69	11.49	3.80	2.82	4.06	26.86	29.04	50.39	20.57	100
Edum3	2.23	2.97	4.64	4.26	3.40	17.50	30.21	32.91	36.88	100
Edum4	0.81	1.34	2.25	8.00	2.68	15.08		64.52	35.48	100
Edum0	1.30	0.70	0.60	0.72		3.32				
Total	32.50	20.70	13.80	17.5	15.54	100				
	Tph: father summary									
f<m	24.79	21.55	17.08							
f=m	75.21	57.45	35.23	47.73						
f>m		21.00	47.68	52.27						
total	100	100	100	100						

Legend: Tph denotes two parent household; m<f, m=f and m>f denote the percentage at each educational level of the mother in which she is less, equal or more educated than her husband; similarly f<m, f=m and f>m denote the percentage at each educational level of the father in which he is less, equal or more educated than his wife.
EdumX: educational level of the mother for X{1,2,34}; EdufX idem for father.
Edum0 is no data for mother, which means single-parent home with father.
Eduf0 is no data for father, which means single-parent home with mother

Table A3
Classification of studies in the Labor Force Survey (EPA) and their grouping into four levels of dependent variable and dummies for parents

CNED-2000	Contents of EPA classification	Educ. Level
11	Not completed primary education	Edu1g
12	Completed primary education	Edu1g
21	Programs for training and employment that do not require an academic degree of the 1st stage of secondary for implementation.	Edu1voc
22	1st stage of secondary unfinished.	Edu1g
23	1st stage of secondary completed (compulsory education).	Edu2g
36	Professional initiation (does not need completed compulsory education).	Edu1voc
31	Programs for training and employment that require a high school diploma 1st stage for implementation	Edu2voc
32	Upper secondary	Edu3g
33	Intermediate level of specific vocational training, visual arts and design and sports	Edu3voc
34	Intermediate level of music and dance.	Edu3voc
41	Programs for training and employment that require a high school diploma 2nd stage for implementation	Edu3voc
51	Higher level of specific vocational training, visual arts and design and sports	Edu4voc
52	Own degrees from universities other than graduate (two years or more)	Edu4voc
53	Programs that require a degree of higher-level vocational training for its realization (over 300 hours or 6 months).	Edu4voc
50	Degree studies (from 2009)	Edu4g
54	1st cycle university education or equivalent and who have passed 2 complete courses of a bachelor's degree or equivalent credits..	Edu4g
55	University education of 1st and 2nd cycle, 2nd cycle only and equivalents.	Edu4g
56	Official programs of vocational specialization	Edu4voc
59	Official university Masters (from 2009)	Edu4g
61	PhD degree	Edu4g
80	Illiterate	Edu10

Legend. Extensions *g* and *voc* denote general education and vocational training, respectively.
Classification of education in four levels for dependent variable and for parents education levels ***Edux*** with *x{1,2,3,4}*: less than compulsory ***Edu1****=Edu10+Edu1g+Edu1voc* ; compulsory education ***Edu2****=Edu2g+Edu2voc;* upper secondary ***Edu3****=Edu3g+Edu3fpo;*higher education ***Edu4****=Edu4voc+Edu41g+Edu42g*.
Dummy for vocational training of parents *Vocp=Edup1voc+Edup2voc+Edup3voc + Edup4voc.*
Note: CNED 2000 stands for Clasificación Nacional de Educación 2000 which corresponds to International Standard Classification of Education ISCED-1997 of UNESCO

Table A4
Multinomial Logit estimations of attainment education levels for young adults at ages 16 to 25 cohabiting with parents. Spain 2002-2013. Base outcome *Edu2*

	Girls						Boys					
	edu1		edu3		edu4		edu1		edu3		edu4	
	Coef β	|*t*|	Coef β	|*t*|	Coef β	|*t*|	Coef β	|*t*|	Coef β	|*t*|	Coef β	|*t*|
Age	-0.130	*17.02*	0.322	*66.97*	0.800	*112.38*	-0.145	*29.65*	0.234	*61.10*	0.633	*100.63*
Disabled*	2.833	*20.43*	-1.314	*7.18*	-2.482	*7.56*	2.196	*22.73*	-1.323	*8.14*	-2.000	*7.20*
Sick*	0.854	*7.80*	-0.756	*7.10*	-1.051	*6.46*	0.573	*7.55*	-0.727	*7.95*	-1.015	*7.57*
Immigrant*	0.529	*7.61*	-0.411	*6.28*	-1.486	*12.01*	0.386	*6.90*	-0.300	*5.04*	-0.988	*7.74*
Immig2g*	0.195	*1.37*	-0.116	*0.97*	-0.616	*2.77*	0.152	*1.24*	-0.136	*1.17*	-0.601	*3.14*
HUR	0.542	*11.43*	-0.390	*9.33*	-0.457	*8.15*	0.570	*14.68*	-0.417	*10.11*	-0.387	*6.64*
Ot-disabled	0.081	*1.95*	-0.135	*3.93*	-0.248	*5.24*	0.176	*5.41*	-0.120	*3.75*	-0.245	*5.56*
Ot-sick	0.208	*5.10*	-0.153	*4.49*	-0.220	*4.78*	0.175	*5.50*	-0.219	*6.89*	-0.298	*6.64*
Ot-adult	0.040	*1.41*	-0.111	*4.64*	-0.208	*6.25*	0.055	*2.31*	-0.029	*1.30*	-0.060	*1.96*
Rmobility*	-0.067	*0.41*	0.445	*3.88*	0.540	*4.07*	-0.037	*0.27*	0.643	*5.91*	0.867	*6.70*
O-sibling	0.155	*7.96*	-0.105	*6.91*	-0.202	*9.44*	0.120	*7.07*	-0.065	*4.33*	-0.087	*4.16*
Y-sibling	0.186	*9.83*	-0.197	*13.51*	-0.308	*16.22*	0.150	*10.58*	-0.131	*9.55*	-0.217	*11.54*
%sisters	-0.154	*4.31*	0.126	*5.17*	0.188	*5.67*	-0.091	*1.83*	0.139	*3.19*	0.097	*1.57*
Meab*	0.302	*5.56*	-0.366	*7.87*	-0.635	*9.44*	0.328	*7.76*	-0.404	*9.05*	-0.842	*12.57*
Mlab*	-0.105	*1.08*	0.111	*1.47*	-0.062	*0.57*	-0.054	*0.77*	0.049	*0.70*	0.132	*1.42*
Edup10*	0.183	*3.44*	-0.322	*6.13*	-0.704	*9.67*	0.177	*4.15*	-0.165	*3.32*	-0.356	*5.06*
Edup20	-0.446	*7.02*	0.130	*2.36*	0.170	*2.15*	-0.428	*8.32*	0.119	*2.24*	0.096	*1.16*
Edup30*	-0.718	*7.70*	0.869	*13.84*	0.900	*10.52*	-0.815	*11.85*	0.899	*15.29*	0.899	*10.33*
Edup40*	-0.922	*8.29*	1.221	*18.11*	1.588	*18.14*	-1.003	*11.06*	1.345	*23.13*	1.722	*21.25*
Edup21*	-0.380	*7.79*	0.283	*6.88*	0.339	*5.91*	-0.339	*9.10*	0.177	*4.49*	0.414	*7.50*
Edup22*	-0.612	*11.98*	0.457	*11.91*	0.676	*12.80*	-0.747	*19.75*	0.389	*10.61*	0.546	*10.02*
Edup31*	-0.567	*6.76*	0.854	*15.49*	1.110	*15.00*	-0.561	*8.56*	0.961	*18.71*	1.078	*15.11*

Edup32*	-0.990	*13.16*	0.782	*16.77*	1.124	*17.69*	-0.992	*17.31*	0.984	*22.50*	1.370	*22.22*
Edup33*	-1.127	*10.02*	1.191	*20.85*	1.620	*21.60*	-1.306	*16.37*	1.282	*24.74*	1.629	*22.36*
Edup41*	-0.763	*6.62*	0.988	*14.46*	1.410	*16.44*	-0.828	*9.15*	1.262	*19.05*	1.723	*20.63*
Edup42*	-1.321	*12.25*	1.003	*18.43*	1.578	*22.57*	-1.174	*15.21*	1.301	*25.13*	1.857	*26.65*
Edup43*	-1.316	*12.65*	1.218	*25.65*	1.872	*31.15*	-1.606	*20.98*	1.515	*34.05*	2.010	*33.94*
Edup44*	-1.687	*15.37*	1.329	*30.61*	2.070	*37.89*	-1.862	*23.76*	1.695	*41.48*	2.391	*45.07*
Vocp*	0.175	*2.99*	-0.184	*6.05*	-0.235	*5.88*	0.179	*4.15*	-0.284	*9.96*	-0.245	*6.19*
y2003*	-0.030	*0.50*	-0.113	*2.71*	-0.163	*2.81*	0.094	*2.01*	-0.129	*3.23*	-0.107	*1.95*
y2004*	0.052	*0.88*	-0.150	*3.52*	-0.229	*3.90*	0.151	*3.20*	-0.173	*4.28*	-0.262	*4.64*
y2005*	0.212	*3.18*	-0.162	*3.52*	-0.221	*3.50*	0.280	*5.53*	-0.216	*5.01*	-0.350	*5.82*
y2006*	0.299	*4.55*	-0.068	*1.46*	-0.144	*2.30*	0.450	*9.09*	-0.220	*5.12*	-0.380	*6.33*
y2007*	0.354	*5.42*	-0.182	*3.93*	-0.279	*4.45*	0.552	*10.92*	-0.157	*3.63*	-0.315	*5.17*
y2008*	0.480	*7.30*	-0.092	*1.95*	-0.118	*1.84*	0.709	*14.23*	-0.145	*3.28*	-0.207	*3.38*
y2009*	0.485	*7.32*	-0.079	*1.65*	-0.210	*3.23*	0.732	*14.17*	-0.141	*3.09*	-0.330	*5.15*
y2010*	0.535	*7.94*	-0.046	*0.95*	-0.099	*1.51*	0.630	*12.13*	-0.129	*2.83*	-0.381	*5.89*
y2011*	0.480	*6.88*	-0.049	*1.00*	-0.074	*1.12*	0.633	*11.93*	-0.055	*1.19*	-0.395	*5.94*
y2013*	0.355	*4.86*	-0.083	*1.68*	-0.180	*2.69*	0.557	*9.96*	-0.029	*0.61*	-0.207	*3.17*
Constant	1.107	*6.87*	-6.351	*58.86*	-17.52	*103.0*	1.770	*15.97*	-5.202	*55.07*	-15.05	*93.49*
Predicted	0.061		0.466		0.156		0.112		0.368		0.106	
Obs freq	0.100		0.375		0.225		0.154		0.321		0.155	
Obs	96444						106664					
chi2(117)	17804.9						18621.1					
Prob	0						0					
psLL	-100593						-118024					
R2	0.2077						0.1668					

Notes: Edu2 coefficients have been excluded because they are zero by definition in expression 2 of the text;* denotes dummy variable; *Absolute value of t-statistic, $|t|$, in italic letters.* Confidence intervals: 99.9% for $|t| \geq 3.26$; *b*, 99% for $3.26 \geq |t| \geq 2.58$; 95% for $2.58 \geq |t| \geq 1.96$; 90% for $1.96 \geq |t| \geq 1.65$. These intervals respectively report levels of significance of 0.1%, 1%, 5% and 10%.