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Abstract

Recent studies emphasize the impact of macroeconomic factors on educational attainment. They show that although individual factors like the educational level of one's parents play a decisive role in determining the human capital accumulation of the children, the cohort size as well as the local labor market seem to have a significant impact, too. This paper analyzes the impact of birth cohort size as well as unemployment on educational attainment in Europe using the European Community Household Panel. Estimation results suggest that neither the size of the birth cohort nor the local unemployment rate induces a change in the individual's schooling decision.

JEL Classification: I21, J21, J62

Keywords: Educational attainment, demography, multivariate ordered probit

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1. Introduction

A growing number of studies investigate the success of young adults, measured by wages or school attainment. These studies show unanimously that parents' characteristics, especially their own education, are a key determinant of children's schooling (see e.g. ASTONE AND MCLANAHAN 1991; BEHRMAN AND ROSENZWEIG 2002; BLACK, DEVEREUX AND SALVANES 2005; DUSTMANN 2004).

Figure 1: Number of live births in the EU and proportion of population aged 25 (and above) with completed post-secondary education 1960-2002
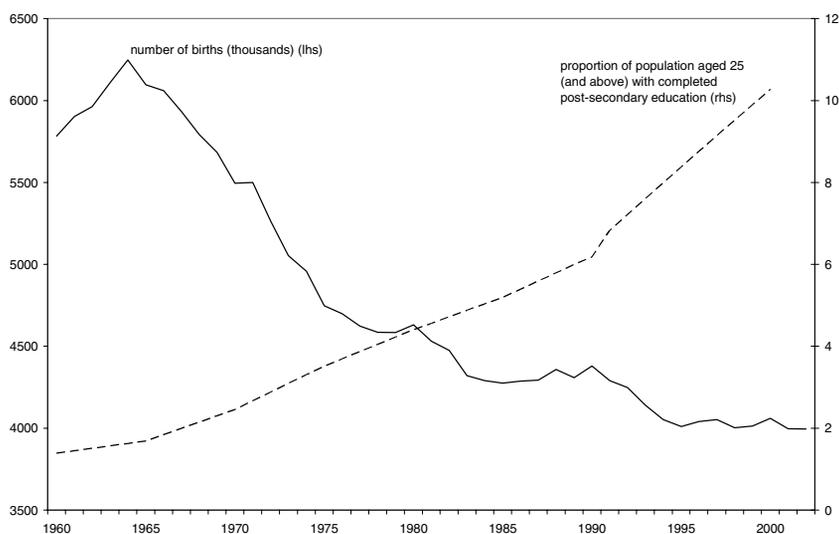
Source: Eurostat and own calculations based on data from BARRO AND LEE (2001). The proportion of population with completed post-secondary education is a weighted average (by means of population shares) of the member countries data. Starting in 1991, data includes the former German Democratic Republic.

Besides these individual determinants of educational attainment aggregate variables, in particular demographic variables, have recently received greater attention. Starting from the notion, that individuals choose their level of schooling depending on the returns of that investment, these are affected by the size of the birth cohort an individual is born in. If jobs for more educated workers also require more on-the-job training (STAPLETON AND YOUNG 1988), individuals born during a demographic boom might be tempted to increase the probability to receive a job when entering the labor market by investing less in schooling.

As one can see from figure 1, this relationship is of profound policy importance in Europe. From a peak in 1964 the number of births in Europe declined by approximately 35 % until 2002. This drop in fertility, or "baby bust", is common to all member states of the European Union,[1] and constitutes a severe challenge for the countries' welfare systems (BÖRSCH-SUPAN 2004). Yet at the same time the proportion of the population with post-secondary education increased nearly tenfold. In fact this might suggest a strong negative relationship between the number of births and educational attainment. If this trade-off holds, it might prove fruitful for Europe as it would counterbalance the quantitatively declining labor force and thus facilitate bearing the rising costs of an ageing society. Yet, economic policy aiming at an increase in fertility might have a negative effect on average schooling.

However, caution is advisable when interpreting this univariate relation between demographical development and educational attainment. First of all, it has to be seen against the background of a simultaneously rising education of the parents and thereby could only reflect the before mentioned impact of parents' characteristics. Secondly, there might just be an autonomous rise in skills over time. In this context, results from LAUER (2003) suggest that an "educational upgrading" across cohorts took place in Germany and France, although only at the secondary level. Finally, it might as well reflect an impact of the current labor market situation on the schooling decision of the youth. If unemployment is high, individuals might try to postpone their entry into the labor market and the easiest, and the most worthwhile way to do so, is to obtain more schooling. DELLAS AND KOUBI (2003) find a countercyclical behavior of school enrollment for the US as do CLARK (2002) and PETRONGOLO AND SAN SEGUNDO (2002) for the UK and Spain, respectively.

Until now, however, there is no aggregate empirical evidence for the determinants of human capital accumulation in Europe. This paper contributes to the closing of this gap by analyzing the impact of family background, cohort size as well as unemployment on educational attainment by means of a common European dataset, the European Community Household Panel (ECHP). It comprises data on 15 countries of the European Union for up to eight years (1994-2001) and there is the advantage that the data is directly comparable as an identical questionnaire has been used in all countries.

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[1] France, with a rather stable number of live births since the beginning of the 1980s might be an exception.

The paper is organized as follows. In section 2 the theoretical link between cohort size and educational attainment is presented. In section 3 the empirical approach as well as the data is explained. Section 4 presents the empirical results, and section 5 concludes.

2. Cohort Size, Unemployment and Educational Attainment – Theory and Empirical Findings

In the US, the baby boom of the 1940s and 1950s and the subsequent baby bust of the 1960s and 1970s has led to studies examining the impact of a changing age structure on labor earnings. Although they all agree that an individual born in a large birth cohort earns less than the one born during a "flat" demographic cycle, all else equal, the schooling choice of the individual complicates the analysis as wages and schooling are simultaneously determined (CONNELLY 1986). The starting point for all models is the basic proposition of human capital theory that individuals try to maximize the net present value of their lifetime earnings and thereupon choose their highest educational level.

DOOLEY AND GOTTSCHALK (1984) start with the assumption that workers of all ages and educational levels are perfect substitutes for each other. Thus, if labor is paid its marginal product, the wage rate is inversely related to the growth rate of the overall labor supply. From the view of a boom cohort then the size of entry cohorts is supposed to decline in the future whereas the wages are about to rise. This in turn implies a rising return to education, which causes the boom cohort to invest more in their human capital.

If labor is heterogeneous solely by age, a change in the size of a birth cohort implies a change of relative wages of that cohort for their whole working lives, as the labor market cohort is fixed for each individual throughout their lives. The consequences for the surrounding cohorts depend on the degree of complementarity to the boom cohort. They might even experience a rise in wages if they are complementary to the boom cohort while those being the nearest substitute have to accept declining wages, too. Yet, FREEMAN (1979) already recognized that the imperfect substitutability between young and old workers is especially marked for the group of high college graduates.

Thus, with labor being heterogeneous by age and schooling, members of the same birth cohort may be members of different labor market groups. The educational level is chosen once again according to the net present value of earnings associated with it. These returns are affected in

two different ways. Firstly, there is a direct effect of an increase in cohort size on earnings. Assuming schooling is determined exogenously, a demographic boom lowers the wages of all labor market groups. CONNELLY (1986), calculating wage elasticities for the US, showed that wage cuts are the largest for the group of young skilled workers, which, for itself, would imply that members of a boom cohort reduce schooling. Secondly, there is an indirect effect as the schooling choice of the individuals will change the overall age-schooling groups and thus their relative wages. Yet individuals have once again to consider their future wages when deciding about attending school, which thus entails a decisive role for the exact model of expectation formation. However, CONNELLY (1986) compares models incorporating static (WACHTER AND KIM 1982) and rational expectations and concludes that both of these models imply a reduction in schooling of the boom cohort,[2] even though the size of the impact differs.

In the model of STAPLETON AND YOUNG (1988), the degree of substitutability between young and old workers decreases with schooling. This results from the fact that jobs carried out by individuals with more schooling also require more training. Thus, although lifetime income is in general lower for a boom cohort, regardless of career choice, highly educated individuals will transit less rapidly into working life (or experience the greater decline in wages) which implies that for this group the effect of demographic change is more pronounced. Individuals born in a boom cohort therefore face fewer incentives to acquire schooling. Stapleton and Young confirm the predictions of their model empirically for the US.

Other authors mostly confirm these results. CONNELLY AND GOTTSCHALK (1995) incorporate the educational background of the parents in their model of cohort composition effects. They distinguish a direct impact through the educational background of their parents and an indirect behavioral effect from changes in the proportion of children raised by college-educated parents. Firstly, higher educated parents are simply more likely to send their children to college. Secondly, there exists a differing, but only partly offsetting, behavioral effect as the returns to a college degree decline with a higher supply of college-educated children. Therefore parents may invest less in their children. Estimating a probit model for the probability of attending college shows that this probability falls with the proportion of children with college-educated parents and the relative cohort size.

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[2] An exception is the case of a low discount rate and static expectations where individuals born in a boom cohort would increase schooling. This is because individuals take the relatively high wages of today's older skilled workers for granted and the net present value of this wage is relatively high.

CARD AND LEMIEUX (2000) analyze the impact of the relative size of the cohort currently enrolled in school on schooling attainment for the U.S. from the end of the 1960s to the mid 1990s. Using various data sources and estimating a model incorporating both demand- and supply- side factors their results suggest a negative impact of cohort size on human capital accumulation.

In contrast, FALARIS AND PETERS (1991), estimating reduced-form education and age-at-completion equations, report that during a demographic peak or trough individuals do not respond to the relative size of one's own cohort. During demographic downswings individuals acquire relatively less schooling as is the case at the end of a cycle. In addition, their predictions are similar to the ones from STAPLETON AND YOUNG (1988) during demographic upswings and baby busts.

In sum, the impact of the cohort size on educational attainment seems to depend on the assumptions of the underlying model about the elasticities of complementarity of labor. Yet models where labor is heterogeneous by age and schooling, suggest that members of a boom cohort acquire less schooling than those born during a "flat" cycle and this behavior is mostly confirmed by empirical studies for the US. The aim of the following paragraph is to provide empirical evidence for Europe.

3. Empirical Evidence for the European Union

3.1 Empirical Approach

The outcome of the schooling decision of an individual is regarded as a dependent variable with a natural order. According to the ECHP questionnaire, 1 denotes less than second stage of secondary education (ISCED levels 0-2), 2 the second stage of secondary education (ISCED level 3) and 3 comprises the third level education (ISCED levels 5-7).

Therefore, an ordered probit model is applied. In particular, the model assumes that there are cutoff points which relate the observed variable to a latent variable. The fundamental idea is that there is a latent, continuously distributed random variable underlying the ordered response, which represents the individual's propensity to education. This latent variable Z_i is a linear function of explanatory variables and is related to the observable categorical variable Y_i with the outcomes 1, 2 and 3 as follows:

$$Y_i = \begin{cases} 1 & if \quad Z_i \leq 0 \\ 2 & if \quad 0 < Z_i \leq Z* \\ 3 & if \quad Z* < Z_i \end{cases}$$

The cutoff point $Z*$ is estimated along with β.[3] The individual chooses its optimal schooling level maximizing the net present value associated with it. Thus the thresholds can be interpreted as the points where the marginal costs associated with a higher educational level correspond to its marginal returns (CAMERON AND HECKMAN 1998). Finally, assuming that the error term is normally distributed with zero mean and a standard deviation of one, the following probabilities hold:

$$\Pr(Y_i = 1) = 1 - \phi(\beta X_i)$$
$$\Pr(Y_i = 2) = \phi(Z* - \beta X_i) - \phi(-\beta X_i)$$
$$\Pr(Y_i = 3) = 1 - \phi(Z* - \beta X_i).$$

Here ϕ denotes the standard normal cumulative distribution function. The parameters are estimated using maximum likelihood. Due to the nonlinearity of the regression model, however, the coefficients do not represent the marginal effects of an explanatory variable. There are two well-established methods of calculating the marginal effects (see e.g. LONG 1997). Either one computes them at specific values of the independent variables, most often at their mean (marginal effects at the mean). The other possibility is calculating the marginal effects as the average partial change over all observations (average marginal effects). As the former method is a good approximation of the latter (see GREENE 1997: 876) we will subsequently calculate marginal effects of the variables at their mean.

3.2 Data description

In this paper data from the ECHP is utilized.[4] It is a longitudinal data set and covers eight waves from 1994 to 2001. Starting with 60.500 households from 12 member states[5] the ECHP

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[3] As an intercept is included in the equation for Z_i, the first threshold value is set to zero.
[4] For a description of the ECHP see Eurostat (2003) as well as the website of the EuroPanel Users Network (EPUNet) http://epunet.essex.ac.uk.

thereafter has been extended with Austria, Finland and Sweden joining in 1995, 1996 and 1997, respectively. For most of the countries, a harmonized ECHP questionnaire has been used. Exceptions are the UK, Germany, Luxembourg and Sweden for which data was converted from national surveys.[6]

For the analysis, data from all waves is used. To extend the number of observations, national survey data is preferred in cases where ECHP questionnaires coexisted. As became apparent from the previous section, parents' attributes play a major role as a determinant of their children's human capital accumulation. Unfortunately, there is no enquiry for parents' characteristics in the ECHP questionnaires. Therefore, these had to be collected from matching parents to their children via the relationship file of the ECHP. From these observations every one is excluded in which the child or one of the parents were still in school. As this question was not part of every country's questionnaire however, the final sample comprises Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Portugal, Spain and the UK.

Because of the matching procedure described above, there is the possibility of a sample selection bias. As children in southern European countries usually stay at home until they are getting married, whereas children in Northern European countries leave home for college (IACOVOU 2002), there should be much more observations from Southern European countries in the sample. Indeed, the number of observations by country showed that the observations from Italy, Spain, Portugal and Greece are five times the ones from the other European countries, exceptions being Austria and Ireland. Therefore, the weights used for estimation have been adjusted to the sample size by the use of inflation factors.[7]

As already noted, information on the highest completed educational level is coded as being 1 for individuals with less than second stage of secondary education, 2 for individuals with second stage of secondary education and 3 for individuals with third level education. The set of explanatory variables can be divided into subsets of individual characteristics, parental background information and aggregate variables.[8] The former comprises a dummy variable for

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[5] Belgium, Denmark, Germany, Greece, Spain, France, Italy, Ireland, Luxembourg, The Netherlands, Portugal and UK.
[6] For the former two countries, converted data from national surveys is provided through 1994 whereas for the latter two countries the ECHP questionnaire has been replaced by national surveys in 1997.
[7] The weights in the ECHP data files are normalised such that the sum over all persons equals the actual number of persons in the sample (EUROSTAT 2003). These normalised weights are then adjusted by inflation factors which were calculated as N/n with N denoting the population and n the actual sample size.
[8] For a detailed description of variables see Appendix A.1.

gender (1 corresponds to male), age and a dummy variable for citizenship (1 corresponds to native). The set of parental background information consists of the highest educational degree of the mother and of the father, income of the father, household size and a dummy variable for the parents being young at birth of the child. Finally the set of aggregate variables comprises a cohort measure (size of the own birth cohort relative to the total population) as well as the unemployment rate for the labor force under 25 years of age.

The variables capturing the parental background of the children are a standard set that emerged from previous research on children's attainment. However in conjunction with the reported data on parents' earnings the concern of a serious measurement error arises (HAVEMEN AND WOLFE 1995: 1842 f.). This is due to the fact that the income of the father is only available for the survey years whereas it should be measured during the education decision of their children. Thus the estimated impact of the father's earnings on the educational attainment of his children is presumably downward biased (SOLON 1992). Therefore it is recommended to measure the average income of the father over a longer time period, which is accounted for by averaging the father's income over as many waves as possible.

The relative cohort size is calculated as the ratio of the absolute own cohort size (the population aged 18-21) during time t of the decision about further education, which is assumed to happen at the age of 19, and the total population at this time. As was pointed out in the theoretical section, although the implications of the theoretical models depend crucially on the assumptions about the substitutability of labor, the more reasonable models suggest that the own relative cohort size exerts a negative impact on the decision about further education.

DELLAS AND KOUBI (2003) analyze the cyclical behavior of schooling in the US with aggregate educational data and find a significant positive correlation with unemployment. Similarly, PETRONGOLO AND SAN SEGUNDO (2002) report strong effects of the local labor market conditions on enrollment in higher education for Spain. Finally, CLARK (2002) reports the same findings for the UK, although only for men. In fact their results suggest that high unemployment prompts the youth to invest in human capital and entails a counter-cyclical behavior of school attainment. The coefficient on our included measure of youth unemployment[9] is therefore expected to be positive. Again we measure the impact of the labor market situation at the time when the youth decides about further education, that is when they are 19 years old.

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[9] Source: Eurostat.

Table 1: Summary Statistics

Variable	Male		Female	
	Mean	Std. dev.	Mean	Std. dev.
Highest Educational Degree	1.659	.132	1.729	.127
Native	.904	.060	.902	.062
Age	22.012	.767	21.871	.641
Father with medium education	.135	.041	.146	.038
Father with high education	.380	.141	.293	.077
Mother with medium education	.173	.056	.211	.042
Mother with high education	.253	.107	.183	.059
Parents young at birth	.112	.011	.100	.026
Log Income Father	8.642	1.137	8.555	1.178
Household Size	4.419	.235	4.362	.181
Unemployment rate age<25	17.940	3.056	25.315	5.038
Relative Cohort Size	4.110	.281	4.153	.257
Observations	6,494		5,602	

Notes: Weighted summary statistics. Cross sectional weights adjusted by inflation factors.

Table 1 shows the summary statistics of the sample used in our analysis. It becomes transparent that there are almost as many women in the sample as there are men and that the former are slightly better educated. Furthermore, the independent variables appear to be very similar in size for men and women. Due to the problem of youth unemployment in most European countries, the mean of the unemployment measure is quite high with a sizeable disadvantage of women.

4. Estimation Results

In the literature on children's schooling attainment it is common practice either to estimate regressions containing a dummy variable depicting the gender of the individuals or to estimate separate regressions for each gender. To decide amongst these options, we estimate an ordered probit model including a dummy variable for males and interaction terms for all explanatory variables.[10] A Wald-Test on the overall significance of the interaction terms indicates that separate regressions are to prefer.[11]

A first model for men considering the individual and parental characteristics (table 2, column (1)) shows that all variables are statistically significant and display the proposed signs, except

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[10] Results are available from the author upon request.
[11] The interaction terms were statistically significant at the 1% level.

for the dummy variables capturing if one is a native citizen and if one's parents were young during the birth of the child, which turn out, however, to be insignificant. Yet, results suggest that there is a decrease in educational attainment over time (the impact of age on the probability of obtaining a higher schooling degree is positive).

To interpret the impact of a change of the independent variables, however, it is necessary to calculate marginal effects. These are reported for the outcomes 1 (less than second stage of secondary education) and 3 (third level education), respectively, in table 3. First of all, the strong impact of parental characteristics becomes apparent. Having a father with high education displays the strongest impact on the probability of males of obtaining a high education themselves. The latter is raised by 16 percentage points (table 3, column (1b)).

Subsequently, the model is extended by the measure of relative cohort size as well as an indicator of the labor market situation (column (2) in table 2 and columns (2a) and (2b) in table 3, respectively). Firstly, we find no significant impact of the cohort size on male educational attainment. Secondly, schooling seems not to be countercyclical in Europe as the unemployment rate exerts no statistically significant impact on the probability of males to get a higher educational degree. Thus, results from CLARK (2002) for the UK, who showed that men react to a rise in unemployment by getting more schooling, could not be confirmed for the larger EU-sample. A reason for this finding might be that there are factors counteracting the cyclical behavior of schooling. In particular, capital market imperfections might lead to a procyclical pattern of credit supply and thus of the ability to acquire schooling (DELLAS AND KOUBI 2003: 845). Surprisingly, possessing a domestic citizenship has a counterintuitive negative impact on educational attainment, although the coefficient is only significant at the 10%-level and even not significant across specifications.

Table 2: Determinants of highest educational level completed – *Ordered Probit estimates*

Variable	Males		Females	
	(1)	(2)	(3)	(4)
Native (Dummy)	.073 (0.55)	-.310 (2.03)*	.140 (0.65)	.013 (0.12)
Age	.124 (4.22)***	.190 (3.91)***	.123 (3.22)***	.144 (4.33)***
Father with medium education (Dummy)	.224 (2.15)**	.174 (1.71)	.198 (1.83)*	.307 (3.95)***
Father with high education (Dummy)	.682 (10.20)***	.597 (9.21)***	.545 (8.02)***	.343 (3.26)***
Mother with medium education (Dummy)	.454 (3.42)***	.416 (3.54)***	.142 (1.47)	.090 (0.73)
Mother with high education (Dummy)	.294 (2.26)***	.244 (2.98)***	.374 (6.84)***	.405 (4.47)***
Parents young at birth (Dummy)	.066 (0.49)	.049 (0.37)	-.427 (2.81)***	-.244 (1.73)
Log Income Father	.185 (3.71)***	.258 (2.43)**	.274 (7.17)***	.193 (5.51)***
Household Size	-.142 (1.86)*	-.104 (2.16)**	.020 (0.42)	-.022 (0.57)
Unemployment Rate	–	-.017 (1.33)	–	-.021 (1.59)
Relative Cohort Size	–	-.493 (1.20)	–	.173 (0.96)
Country Dummies				
Austria	.053 (0.76)	1.435 (2.78)**	.058 (1.29)	.379 (1.33)
Belgium	.386 (8.01)***	1.363 (7.61)***	.619 (6.47)***	1.311 (7.19)***
Denmark	.272 (19.50)***	1.230 (8.13)***	.374 (5.44)***	.789 (8.02)***
Finland	.395 (10.44)***	1.628 (7.22)***	.305 (2.19)**	1.042 (5.47)***
France	.345 (8.03)***	1.687 (4.45)***	.592 (10.51)***	1.122 (3.59)***
Germany	-.567 (9.73)***	-.216 (0.98)	-.643 (7.41)***	-.202 (1.56)
Greece	.332 (5.60)***	1.664 (4.41)***	.589 (10.30)***	1.325 (3.51)***
Ireland	.694 (5.10)***	2.763 (2.81)***	.410 (3.90)***	.784 (1.83)*
Italy	1.375 (3.80)***	3.130 (3.08)***	2.011 (8.76)***	2.164 (4.29)***
Spain	.573 (5.20)***	2.246 (3.20)***	.503 (4.31)***	1.543 (2.67)**
UK	.519 (5.41)***	1.478 (5.91)***	.197 (2.21)**	.620 (5.08)***
Limit 1	4.565 (5.12)***	5.201 (3.68)***	5.832 (4.58)***	5.914 (6.99)***
Limit 2	5.836 (5.47)***	6.514 (3.86)***	7.015 (5.29)***	7.285 (6.74)***
Obs	7,248	6,494	6,092	5,602

Notes: Robust estimates. t-ratios in parentheses. */**/***: significant at 10%, 5% and 1%-level, respectively. Number of observations by country and model: Austria (809/772/720/683), Belgium (353/341/297/292), Denmark (185/182/144/141), Finland (82/73/42/41), France (243/221/136/132), Germany (132/91/123/98), Greece (788/722/628/616), Ireland (727/646/647/570), Italy (1,581/1,469/1,371/1,316), Portugal (809/772/720/683), Spain (1,532/1,450/1,291/1,226), UK (209/195/146/138). For a description of variables see Appendix A1.

Interestingly, the country dummies reveal that Portugal and Germany perform rather poorly in comparison to the other EU member states. Male individuals of all other countries in the sample, everything else equal, exhibit a statistically significant higher probability of receiving a high educational degree in comparison to Portugal and Germany. This suggests that there are factors inherent to the educational systems of these two countries weighing on educational attainment.

Estimation results for females (table 2, column (3)) show, that all coefficients are statistically significant and exhibit the proposed signs except for the household size and dummy variables indicating whether one is a native citizen or not and whether the mother completed the second stage of secondary education, which turn out to be insignificant. Yet, results show that there is a negative time-trend in educational attainment (the impact of age on the probability of obtaining a higher schooling degree is positive).

The marginal effects are reported for the outcomes 1 and 3, respectively, in table 3 (column (3) and (4)). First of all, the strong impact of parental characteristics becomes apparent. However, going further into detail reveals that the educational attainment of the father has in sum a greater impact on the probability of females of obtaining a higher schooling degree than that of the mother. If the father has a third level education instead of less than secondary stage of second education, this raises the probability of the daughter to obtain a third level education herself by 6.6 % (column (4)). If the parents are young during at birth of their child, this lowers the probability to obtain a third level education by 4.1 %. This variable is supposed to reflect the living conditions of the children as those couples which are young during the birth of the child are subject to lower marital stability (HOFFERTH 1987). Interestingly, teenage fertility of one's parents exhibits only a significant impact on the educational attainment of women, which implies that rather daughters are prone to marital stability, which might seem reasonable. Concerning the role of parents' education in the process of human capital accumulation, there seems to be no significant difference between males and females. Germany and Portugal perform once again poor in comparison to the other EU member countries in the sample, as does Austria. Women from these countries, everything else equal, have a lower probability of getting a high educational degree, than women in other European countries.

Table 3: Marginal effects of variables

Variable	Males				Females			
	(1a) Y=1	(1b) Y=3	(2a) Y=1	(2b) Y=3	(3a) Y=1	(3b) Y=3	(4a) Y=1	(4b) Y=3
Native (Dummy)†	-.029 (0.55)	.015 (0.63)	.123 (2.03)**	-.058 (1.27)	-.055 (0.65)	.033 (0.65)	-.010 (0.25)	.005 (0.27)
Age	-.049 (4.35)***	.027 (5.87)***	-.076 (3.91)***	.031 (3.13)***	-.048 (3.30)***	.031 (3.68)***	-.053 (4.63)***	.025 (5.72)***
Father with medium education (Dummy)†	-.087 (2.29)**	.053 (2.79)***	-.070 (1.72)*	.030 (2.10)**	-.076 (1.90)*	.054 (1.73)*	-.112 (3.29)***	.062 (2.64)***
Father with high education (Dummy)†	-.259 (10.07)***	.160 (4.73)***	-.235 (9.46)***	.106 (3.38)***	-.204 (7.19)***	.149 (4.33)***	-.127 (2.80)***	.066 (1.76)*
Mother with medium education (Dummy)†	-.171 (3.62)***	.114 (2.82)***	-.164 (3.65)***	.080 (2.62)***	-.054 (1.52)	.037 (1.65)*	-.030 (0.66)	.015 (0.74)
Mother with high education (Dummy)†	-.114 (2.41)**	.068 (3.31)***	-.097 (3.01)***	.043 (3.34)***	-.141 (7.89)***	.103 (7.08)***	-.131 (4.59)***	.071 (4.52)***
Parents young at birth (Dummy)†	-.026 (0.49)	.015 (0.44)	-.020 (0.37)	.008 (0.34)	.169 (2.81)***	-.091 (2.89)***	.099 (2.01)**	-.041 (2.67)***
Log Income Father	-.073 (3.73)***	.040 (3.48)***	-.103 (2.43)**	.041 (2.78)***	-.107 (6.62)***	.069 (4.29)***	-.113 (6.26)***	.054 (3.79)***
Household Size	.056 (1.87)*	-.030 (2.08)**	.042 (2.16)**	-.017 (2.27)**	-.008 (0.42)	.005 (0.40)	.006 (0.38)	-.003 (0.42)
Unemployment Rate	–	–	.007 (1.32)	-.003 (1.87)*	–	–	.006 (1.35)	-.003 (1.08)
Relative Cohort Size	–	–	.196 (1.21)	-.079 (1.08)	–	–	-.083 (1.27)	.040 (1.27)
Country Dummies								
Austria†	-.021 (0.76)	.012 (0.76)	-.447 (4.55)***	.432 (2.13)**	-.022 (1.33)	.015 (1.41)	-.131 (1.45)	.078 (1.09)
Belgium†	-.145 (9.32)***	.100 (5.03)***	-.434 (17.54)***	.404 (12.79)***	-.214 (12.02)***	.196 (11.39)***	-.367 (10.48)***	.394 (5.16)***
Denmark†	-.104 (16.78)***	.067 (5.12)***	-.404 (11.95)***	.357 (6.67)***	-.137 (6.86)***	.110 (7.36)***	-.290 (10.48)***	.250 (4.76)***
Finland†	-.147 (14.10)***	.103 (6.63)***	-.440 (30.54)***	.532 (11.99)***	-.113 (2.53)***	.088 (2.47)***	-.323 (7.08)***	.313 (3.41)***
France†	-.131 (9.47)***	.086 (5.58)***	-.510 (7.96)***	.505 (4.04)***	-.209 (21.83)***	.183 (15.04)***	-.340 (4.88)***	.299 (2.47)***
Germany†	.223 (10.07)***	-.104 (5.27)***	.085 (1.00)	-.032 (0.89)	.251 (7.27)***	-.139 (3.90)***	.135 (3.32)***	-.057 (2.16)**
Greece†	-.126 (6.18)***	.084 (4.72)***	-.480 (8.89)***	.522 (4.15)***	-.205 (21.76)***	.185 (24.95)***	-.353 (5.70)***	.357 (2.72)***
Ireland†	-.241 (6.79)***	.204 (5.22)***	-.524 (11.53)***	.833 (5.51)***	-.148 (5.16)***	.123 (4.96)***	-.260 (2.38)**	.211 (1.36)
Italy†	-.431 (5.68)***	.425 (3.37)***	-.705 (9.98)***	.866 (5.75)***	-.511 (10.14)***	.667 (9.01)***	-.615 (10.21)***	.809 (7.41)***
Spain†	-.211 (6.14)***	.152 (5.40)***	-.603 (7.54)***	.676 (3.47)	-.183 (5.72)***	.148 (5.84)***	-.398 (3.73)***	.357 (1.93)**
UK†	-.195 (6.77)***	.132 (9.32)***	-.503 (10.33)***	.386 (4.15)***	-.075 (2.39)**	.053 (2.80)***	-.267 (5.58)***	.178 (3.18)***
Pr (Y=1) b/w Pr (Y=3)	.436	.133	.515	.088	.409	.170	.433	.109

Notes: marginal effects at the means of the variables. z-ratios in parenthesis. †: discrete change of the dummy variable. Pr(Y=1) and Pr(Y=3): Predicted probability of Y=1 and Y=3 given the variables at their mean. For a description of variables see Appendix A1.

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Extending the regression by the cohort size measure as well as the unemployment rate (column (4) in table 2 and columns (4a) and (4b) in table 3, respectively), results are similar to those obtained for men. In particular, the relative size of one's own cohort shows no significant impact on the probability of females to obtain a higher schooling degree. For females, however, this result may not be surprising as they can easier change their labor force participation. More precisely, they can start a family at this point of time. Furthermore, the unemployment rate exhibits no significant impact on female educational attainment.

Stability tests

As the individuals might decide about their education considering longer-term prospects (FALARIS AND PETERS 1991), the cohort size measure has been stretched to comprise the cohort of 15-24 year olds. Yet there was no basic change in results as we still found no statistical significant impact of the cohort size on educational attainment for both men and women.[12]

COUCH AND LILLARD (1998) note that excluding pairs from the sample where the parent became unemployed creates a bias in the parental income variable, as people with lower income are also those with a greater exposure to unemployment. However, calculating parental income including periods where the father was unemployed changed the estimation results only slightly, i.e. the impact of log income became a bit larger.[13]

Finally, results could be susceptible to the inclusion of parental income at all. Although the income of the father and his educational attainment, with a correlation coefficient of 0.2, are only weakly correlated in our sample, estimations have been carried out without the income variable. As presumed, the coefficients on the educational background of the father become larger. However, as one can see from the estimation results, in nearly all of the specifications there remains a significant impact of parental income, holding constant parental education.

5. Conclusions

Recent research on educational attainment emphasized the impact of macroeconomic factors on educational attainment. Especially in the US, the baby boom of the 1940s and 1950s and

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[12] Results are available from the author upon request.
[13] Estimation results are available from the author upon request.

the subsequent baby bust of the 1960s and 1970s has led to studies examining the impact of a changing age structure on the schooling decision of the youth. Yet, in Europe the question is of vital interest because a higher educational attainment of the youth might counterbalance the quantitatively declining labor force. This paper contributes to the existing literature by explicitly analyzing the role of the demographic cycle as well as unemployment in the schooling choice of individuals in the EU. Thereby we use the ECHP, a data set gathered from a harmonized questionnaire.

In general, we find no significant impact of the unemployment rate on the education decision of the youth. This could be due to the fact that there are factors counteracting the countercyclical incentives to acquire schooling. In particular, the existence of capital market imperfections might lead to a procyclical pattern of credit supply and thus the ability to acquire schooling (DELLAS AND KOUBI 2003: 845).

Furthermore, we do not find a statistically significant impact of demographic development on educational attainment. More precisely, neither for men nor women the size of one's own cohort does induce a change in the individual's schooling decision. Thus, results are contrary to studies for the US, which mostly find the effect of the cohort size on educational attainment to be negative (CONNELLY (1986); STAPLETON AND YOUNG (1988); CONNELLY AND GOTTSCHALK (1995); CARD AND LEMIEUX (2000)). According to our results, the decline in birth rates all over Europe in the last forty years has not incentivized the children to invest more in human capital and thus counterbalanced the quantitatively declining labor force. To bear the rising costs of an ageing society it is therefore all the more important to raise fertility in Europe.

Appendix A.1

Description of variables

Variable	Description	Source
Highest educational level completed	Coded from 1 to 3 1: less than second stage of secondary education (ISCED levels 0-2) 2: second stage of secondary education (ISCED level 3) 3: recognized third level education (ISCED level 5-7)	*ECHP*
Age	Age of the respondent	*ECHP*
Native	Dummy Variable	*ECHP*
Father with medium education	Dummy Variable: Father with second stage of secondary education (ISCED level 3)	*ECHP*
Father with high education	Dummy Variable: Father with recognized third level education (ISCED level 5-7)	*ECHP*
Mother with medium education	Dummy Variable: Mother second stage of secondary education (ISCED level 3)	*ECHP*
Mother with high education	Dummy Variable: Mother with recognized third level education (ISCED level 5-7)	*ECHP*
Parents young at birth	Dummy variable: Mother or Father younger than 21 at birth of the individual	*ECHP*
Log Income father	Log of the annual net income of the father, adjusted by PPPs	*ECHP*
Household Size	Persons living in the household	*ECHP*
Relative cohort size	Ratio of ones own cohort (people aged 18-21) and the whole population (in %)	*Eurostat*
Unemployment rate age<25	Unemployment rate of the workforce under 25 years of age (in %)	*Eurostat*

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