Family Income and Tertiary Education Attendance across the EU: An empirical assessment using sibling data

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Abstract

There is plenty of evidence across the EU to suggest that young people from poorer backgrounds are less likely to attend tertiary education than their better-off peers. This correlation is often used to justify monetary transfers to families with students. It is not clear, however, that these differences in attendance are caused by income itself rather than by parental ability, motivation, education, and other aspects of the young person's experience which differ between families, but are not a direct result of income. Controlling for observable family characteristics is a useful first step. But further developments are needed as families potentially differ in unobservable ways that are correlated with both income and attendance. In this paper we use families with several children to correct for unobserved time-invariant family fixed effects. Our results suggest the absence of parental income effects in Belgium and Germany, small positive effects in Poland, medium-size positive effect in the UK, and sizeable positive effects in Hungary.

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Introduction

The observed correlation between family or household income and educational outcomes, particularly tertiary education attendance, as displayed in Table 1, can be interpreted (Carneiro & Heckman, 2002) as arising from two quite distinct sources:

1. lack of money at the time the decision to stay on is made, whereby low household labour market income and/or insufficient social transfers and lack of access to grants or loans could prevent young individuals from undertaking costly studies.
2. long-term family background and environmental effects, possibly also family wealth[1], which produce both cognitive and non-cognitive ability and also mould children's expectations and tastes with regard to education, all of which crucially affects schooling choices and outcomes.

Table 1: Tertiary education attendance after completion of secondary education and Average Parental Income Percentile. Individuals aged 18-23.

Country	Not attending	Attending
Belgium	42.49	52.29
Germany	41.90	54.60
Hungary	43.27	63.03
Poland	47.41	65.30
UK	36.62	50.84

Source: Cher (2005)

If the real drivers of educational outcomes are long-term factors (innate ability, parental education, parenting styles and other factors) that are related to but not caused by income, then changing income inequality will not affect young people's choices. However, there are clearly mechanisms by which parental income can directly influence attainment, even if tuition fees are low. Being a full-time student entails a big opportunity cost (i.e. the forgone wages). Subsistence and transport costs can also be important and influence the decision made by families and young people to stay on beyond secondary education. If we can produce evidence that parental money has an

[1] Wealth is, of course, logically related to income, earnings and transfers. Yet, it essentially reflects past earnings and savings decision, as well as the effect of transfers that took place years ago. For that reason wealth should be distinguished from short-term variation of income, and rather assimilated as a long-term determinant.

effect, then policies like student benefits or tax credits[2] probably need to be maintained and developed, in order to expand tertiary education attendance, particularly among underprivileged segments of the population. If, however, these constraints do not exist, financial aid to families (student allowances, tax credits) may be very ineffective ways of reaching these educational goals. Increasing tuition fees is also unlikely to dramatically affect the distribution of enrolment across socio-economic groups.

The aim of this paper is to use EU panel data to attempt to separate out the pure effect of short-term parental income (i.e. income contemporaneous to the decision to attend tertiary education) from longer term background influences, such as parental education, final achievements in secondary education, ability or motivation. Many studies suggest that parental income has a (rather small) independent effect on tertiary education attendance or graduation (Carneiro & Heckman, 2002). However, to be confident that the effect of income has been accurately isolated requires more than controlling for observable personal and family background characteristics (gender, parental education or even primary school test scores...). If unobserved family heterogeneity is positively correlated with both attendance and income, this will generate a bias in the relationship between income and child attendance. The difficulty of controlling for this heterogeneity means that the task of separating the influence of short-term income from aspects of long-term family background is not straightforward.

In this paper, following work done in the UK by Blanden & Gregg (2004) with the British Household Panel Survey (BHPS), we use families with several children to account for unobserved family fixed effects. The principle behind sibling fixed effects models is the assumption that the usual OLS error term is composed of two elements: a usual, purely random term, and a family fixed effect which is equal across siblings, and potentially correlated with tertiary education attendance. The sibling fixed effect model is estimated on deviations of attendance and parental income from the family/household mean.

Our results using this sibling model suggest the absence of parental income effect on tertiary education attendance in Belgium and Germany. We find a small positive effect for Poland: a one tertile (33%) increment in family income results in a 3 percentage-points increment in tertiary education attendance. The corresponding figure for the UK suggests a bigger effect of more than 6 percentage points. Finally, we find a strong positive effect for Hungary, where a tertile increment in income distribution generates a jump of 20 percentage points in attendance rate. However, due to sample characteristics, this last result was obtained with a very small number of siblings.

[2] For representative Belgian households, the OECD estimates in 2006 the average value of the tax credit is €988 per year. They will also receive an average child allowance of €2,437 per year. This form of indirect student support is relatively rare in other OECD countries.

The rest of the paper is structured as follows. Section 1 reviews the existing literature on the role of parental money in the decision to attend tertiary education. Section 2 demonstrates how we propose to contribute to this literature using EU household panel data and applying household/family fixed effects models estimated with sibling data. Section 3 presents the EU data we use to apply this method. Section 4 contains the results and analysis. Section 5 concludes.

1. Review of the literature on parental income and tertiary education attendance

Most of the literature so far has focussed on the role of parental income and educational achievement in general (for a review see Mayer, 1997). The literature on short-term family finances and the decision to attend tertiary education -- or their effect on rates of graduation at tertiary level -- is not extensive. Carneiro & Heckman (2002) recently started filling that vacuum. Using US micro data, they initiated a stream of research on "liquidity (or credit) constraints" and tertiary education. Other papers have since applied their analysis to the UK (Dearden et al., 2004) and to Canada (Freynette, 2007).

Carneiro & Heckman (2002) divide parental income distribution into quartiles. They further assume that individuals coming from the top percentile of parental income distribution do not, *by definition*, face liquidity constraints. Consequently, "liquidity/credit constraints" are simply any gap that remains between the proportion of the lower percentile staying on for or completing tertiary education and the proportion of the top percentile, after taking into account long-term family or ability-related effects. Hence, as suggested by Dearden et al. (2004), this is just a convenient term representing the *residual difference* in participation rates after conditioning on a given number of observed time-invariant factors and/or cognitive ability. Formally, the Carneiro & Heckman idea is to estimate the βs of the following linear probability model

$$Yi = \alpha + \beta_1 Q^1{}_i + \beta_2 Q^2{}_i + \beta_3 Q^3{}_i + F'_i \lambda + \varepsilon_i \qquad [1]$$
$$i = 1,\ldots, N$$

where F'_i contains test scores at age 5, 10 or 15 (a proxy for ability) and other observables (parental education,...). Provided there is some variation in income levels among those from each type of background, conditioning on family background and early age test scores when regressing tertiary education attendance or attainment on income should purge the estimates of long-term family and ability-related components. The adequately weighted sum of βs further provides an estimate of the percentage of financially constrained individuals.

Carneiro & Heckman's (2002) results show that few individuals in the US fail to attend tertiary education because of monetary constraints. Overall, they claim that there is little evidence that short-term credit constraints (i.e. belonging to lower parental income quartiles) explain much of the gap in college participation. Setting statistically insignificant gaps as equal to zero, they obtain a range of 0 to 1% for White Females, no gaps for Black and Hispanic Females, and a range of 0-5% for Hispanic Males. Dearden et al. (2004) conclude for the UK that for Males such constraints remains fairly minor (2-3%). They are slightly higher for Females (3-6%). Freynette (2007) finds for Canada that 96% of the total gap in university attendance between youth from the top and bottom income quartiles can be accounted for by differences in observable characteristics. This result points towards approximately 2% of the cohort facing liquidity constraints.

2. Identifying the causal effect of parental income using siblings

The Carneiro & Heckman exercise is very instructive and stimulating. Yet, it falls short of any attempt to control for omitted variable bias. Family income, at any point in time, is potentially positively correlated with a set of omitted variables for family characteristics that (positively) influence education (Y), meaning that the estimated β for parental income (*PINCOME*) in a model such as [2] could be biased (upwards).

$$Y_i = \alpha + \beta\, PINCOME_i + F'_i \lambda + \varepsilon_i \qquad i = 1,\dots, N \qquad [2]$$

A possible solution to this identification problem is to assume that unobserved variables amount to a family fixed effect, and to resort to families with more than one child to eliminate this fixed effect. This approach was applied mainly in the UK by Levy & Duncan (2001), Ermisch et al. (2002) and Blanden & Gregg (2004). Formally, the principle behind a sibling fixed effect model is to assume that the error ε_i consists of two elements

$$Y_i = \alpha + \beta\, PINCOME_i + \varepsilon_i$$
$$\text{with } \varepsilon_i = Z_f + \mu_i \qquad i = 1,\dots, N \qquad [3]$$

where Z_f is the unobserved family fixed effect, equal across siblings, and μ_i is uncorrelated with parental income (*PINCOME*). This model can be estimated by OLS as a linear probability model, with correction for heteroscedasticity. Its great advantage is to offer an easy way around biases generated by family time-invariant unobservables. Blanden & Gregg (2004), applying the sibling identification to data that are very similar to those that we use for the UK, conclude that a rise of 33% (1 tertile) in parental income at age 18 increases the likelihood of *graduation* by 3.33%.

3. Data and estimation strategy

Our main sources of data are national household surveys compiled in Luxembourg by the Consortium of Household Panels for European Socio-Economic Research (CHER). We retained five countries -- Belgium, Germany, Hungary, Poland and the UK[3]-- for which there are simultaneously sufficient observations and adequate information to investigate the effect of parental income on tertiary education attendance. For samples of young adults observed from age 18 to (at most) age 23 (ie. window is 18-24), through various consecutive waves, we managed to gather information about tertiary education attendance (Y_i) and household (mainly parental) income, but also on useful controls such as gender, position of child in family, education or labour market status of parents.

The main disadvantage of the CHER data set is its small effective sample size for some countries (Hungary in particular) where comparatively few young people have completed secondary education, even when several waves are combined. Table 1 gives the total number of individuals per country used in this paper. The same table also presents the breakdown by year of observation (or wave).

Table 2: Observations. Number of individuals, aged 17-24, observed the year after they completed secondary education. Breakdown by year of observation

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
Belgium	0	0	499	57	159	67	72	68	222	0	0	1,144
Germany	719	178	175	199	187	205	189	176	251	202	206	2,687
Hungary	0	0	217	83	54	80	69	38	0	0	0	541
Poland	0	0	0	0	1,101	390	313	736	243	205	218	3,206
UK	0	421	185	154	122	105	124	135	130	105	99	1,580

Source: CHER (2005)

We have excluded from the analysis all individuals still attending full-time secondary education, beyond the age of 18. This choice reflects the situation in some of the countries examined here where grade repetition is quite common and may primarily reflect low ability or past scholastic failure. [4]. But this restriction is mainly justified by the fact that we wanted to consider only individuals who were effectively in a position to choose to attend tertiary education. All our estimates are thus conditional on completion of (upper) secondary education (ISCED 3 according to the OECD-UNESCO classification).

[3] For the UK, CHER gets its data from the British Panel Household Survey (BPHS), that was used by Blanden and Gregg (2004).

[4] Belgium certainly.

We focus on household income in the year after the children completed upper secondary education and examine tertiary education attendance during that particular year or any subsequent year observed in the data.

Income is measured at the level of the household. In CHER it is defined as total income (net of taxes) plus transfers earned by all members of the household. We deduct from that total *wages earned by the children*. We see this as a crucial step in order to properly identify the effect of family income on the decision to attend tertiary education. Almost by definition, those young people who do not stay on beyond secondary school are more likely to enter full-time work and thus to inflate the level of household income as measured in CHER. Moreover, this pattern is likely to be more frequent among low-income families. Hence, correction for children's income is important in order to avoid underestimating the role of family money.

Income used in the analysis is *per head*, as we divide the corrected total mentioned above by the size of the household. However, at the end of the paper, we also present the results obtained with family income *levels*.

Finally, as suggested by Table 1, income is measured at different points in time (for each of the waves present in our sample). CHER consists of household panels, with observations stretching across the whole of the 1990's. We thought that some income normalization was thus necessary. Throughout this paper, we define income as the wave-specific *percentile* to which the family belongs. Note also that the income distribution considered is that of the whole CHER sample, and not the sample of young people (aged 18-23, having completed upper-secondary education) that we use hereafter.

The advantage of our data set is that it provides -- for several (potentially very different) EU countries -- annual measures of income for all households and information on educational qualifications and enrolment for young people within the sample households. CHER also contains a set of controls that are presented in Table 3: gender, position of child in family, age of secondary school completion (a potential proxy for ability), highest educational qualification of father and mother, as well as whether mother is in paid employment.

Table 3: Descriptive statistics. Means of dependent and independent variables

Country	Number of observations	Tertiary educ. Attendance after completion of Sec. Educ	Parental net income percentile*	Female	Age the year after completion of Sec. Educ	Highest qualif. father**	Highest qualif. mother**	Mother is working
Belgium	1,144	0.58	48.19	0.47	20.13	3.04	2.91	0.51
Germany	2,687	0.14	43.66	0.46	19.47	3.33	2.91	0.57
Hungary	541	0.28	49.70	0.47	19.93	2.61	2.33	0.74
Poland	3,206	0.12	49.54	0.49	19.38	2.30	2.37	0.67
UK	1,580	0.27	40.46	0.46	19.04	3.32	2.94	0.75

*Reference = whole population surveyed in each country
**ISCED classification ranging from 0 (no education) to 6 (university degree)
Source: CHER (2005)

Table 4: Descriptive statistics. Destination after completion of secondary education

Country	Tertiary educ. atendance	Apprenticeship	Other (full-time employment, unemployment...)
Belgium	0.58	0.05	0.37
Germany	0.14	0.62	0.24
Hungary	0.32	0.18	0.49
Poland	0.12	0.01	0.87
UK	0.27	0.32	0.41

Source: CHER (2005)

The household surveys forming CHER contain no information on early-age test scores. But the presence of several consecutive waves enables us to pursue the *siblings* identification strategy set out in Section 2. The observation of the decision made by different children within the same family enables us to use sibling variation to eliminate unobserved family fixed effects, as previously done by Blanden & Gregg (2004) for the UK.

One of the drawbacks of the sibling strategy is that only families with two or more children can be considered. Table 5 reports the relatively small (for Hungary in particular) number of families with more than one child that can be used to properly identify the effect of parental income. Another source of concern is that siblings could be close in age and experience similar income patterns for most of their late childhood. We checked for this problem by computing the difference in percentiles between the youngest and the oldest child. Results in Table 6 suggest that there is *a priori* quite a lot of variation within each of the households with more than one child forming our sample. And this is rather useful for identification.

Table 5: Siblings. Number of individuals, aged 18-23, observed the year after they completed secondary education. Breakdown by number of siblings

Country	1	2	3	4	5	6	7	Total	>1
Belgium	532	472	119	19	0	0	0	1,144	610
Germany	1,144	1,126	277	91	17	24	14	2,687	1,549
Hungary	344	185	12	0	0	0	0	541	197
Poland	1,282	1,345	424	123	25	6	0	3,206	1,923
UK	690	659	203	24	15	0	0	1,580	901

Source: CHER (2005)

Table 6: Change in parental income percentile (% distribution). Youngest vs oldest siblings

Country	-100/-50	-50/-30	30/-10	-10/10	10/30	30/50	50/100
Belgium	3.24	3.60	8.27	62.59	12.59	5.76	3.96
Germany	0.79	1.32	7.66	41.35	28.14	13.21	7.53
Hungary	4.21	1.05	25.26	35.79	26.32	5.26	2.11
Poland	3.08	4.62	13.15	48.70	18.13	5.92	6.40
UK	3.26	3.01	8.77	48.12	22.06	9.02	5.76

It might also be argued that most families display very homogeneous patterns of tertiary education attendance (all 1's or all 0's). The outcome of a linear probability model using household-centered data (i.e. OLS where Y_i are replace by Y_i-$Y_.$) would then be trivial, as estimated β in Eq. 3 would mechanically tend to zero. Table 7 suggests that this is not the case for our data. From 22 % (Poland, Germany) to 73 % (Belgium) of our siblings have a brother or as sister who made a different choice regarding tertiary education attendance.

Table 7: Individuals with siblings. Percentage with similar/ different tertiary education attendance status (Yi) after secondary education completion

Country	Similar	Different	Total	Nobs
Belgium	26.20	73.80	100.00	616
Germany	78.11	21.89	100.00	1,725
Hungary	57.20	42.80	100.00	206
Poland	78.13	21.87	100.00	1,950
UK	54.54	45.46	100.00	907

4. Results

All our regressions contains wave/time dummies (for which estimates are not reported), in order to account for the fact that tertiary education can vary (presumably rise) between the beginning and the end of the 1990's, for reasons that are quite independent of the factors considered in this analysis. Results are displayed in Tables 8 to 12, separately for each of the five countries documented in our data set.

We begin by estimating some basic models (OLS with no family fixed effects) of how income percentile per head and tertiary attainment are related (regression [1]). Row correlations, reflecting the effect of a 33- percentile increment in parental income, range from 8-9 percentage points (Belgium, Germany, UK, Poland) to 16 percentage points (Hungary).

We then re-estimate the same basic model with our siblings sample only (regression [2]). Results suggest no major structural difference between the sample and the siblings sub-sample. Coefficients are very similar.

We then gradually introduce controls into the basic model. In regression [3], we control for gender and rank/position of the child. In regression [4] we introduce the age at which the young person completed secondary education. This, in a sense, can be considered as a proxy for ability. In some countries, later completion of secondary education indicates those obliged to repeat grades after failing end-of-year exams. This assumption seems to hold for Belgium and Hungary, but not for Poland and certainly not for Germany, where older age on leaving secondary education seems to correlate with higher attainment at tertiary level *ceteris paribus*.

In regression [5], we add the highest educational qualification attained by the father. In regression [6] we further control for the highest qualification held by the mother. These two controls prove crucial. Including them in the regression reduces the income coefficient quite dramatically. In Belgium it falls from 0.081 to 0.022, and is no longer significant. In Germany the reduction is from 0.063 to 0.031, in Hungary from 0.162 to 0.074, and in Poland from 0.07 to 0.045. It is only for the UK that the coefficient remains almost unchanged, moving from 0.090 to 0.077. In regression [7] we also control for the fact that the mother has (some) remunerated work. The effect of this variable is not dramatic, and varies from country to country.

Our preferred model corresponds to the last two columns of Tables 8 to 12. Regression [8] implements the sibling strategy without any controls except the time/wave dummies. The family/household fixed effect is removed by centering both dependent and independent variables on the household average. In the second sibling regression [9], child-specific controls are included in order to account for characteristics which vary between siblings and may be correlated with income and attainment deviations: gender and position in family of the child. Results show the absence of major difference between the two fixed effect specifications.

Moreover, what our siblings fixed effect estimations reveal is that, compared to regression [7] controlling only for observables, the coefficient of the parental income variable dips further for Belgium and Germany. The coefficient was already non significant in the case of Belgium. It is now also no longer significant for Germany. We observe a very small reduction for Poland and for the UK, but the difference with the regression using non-sibling data is minor, and the income coefficient remains significantly positive. For Poland, a one tertile (33%) increment in family income results in a 3 percentage-point increment in tertiary education attendance. The corresponding figure for the UK suggests a larger effect of more than 6 percentage points. Hungary appears as an exception, as the siblings estimation pushes the income coefficient up dramatically by more than 20 percentage points. One should however keep in mind that the number of siblings this result is based on is extremely small (Nobs=196).

Table 13 gives the results when actual household income level, rather than income per head, is used. Only the estimates for the main interest variable are reported. Differences between these and the previous set of results are negligible.

Table 8 Belgium - Relationship between Parental Income per head and Tertiary Education attendance after completion of secondary education. Linear Probability model. Marginal effect of parental income increment of 33 percentiles on likelihood of staying on [+ P-values!]. Sample average=*0.58*

Variable	(1)	Siblings sample (2)	(3)	(4)	(5)	(6)	(7)	**Siblings Household FE (8)**	**Siblings Household FE (9)**
Parental Income per head	**0.081**	**0.071**	**0.081**	**0.081**	**0.017**	**0.022**	**0.014**	**0.007**	**0.008**
	0.000	**0.001**	**0.000**	**0.000**	**0.364**	**0.258**	**0.499**	**0.879**	**0.862**
Female			0.026	0.019	0.045	0.055	0.056		0.061
			0.346	0.483	0.136	0.075	0.070		0.182
Position among siblings			0.018	0.001	-0.007	-0.002	0.007		0.035
			0.484	0.970	0.796	0.940	0.818		0.338
Age of sec. educ completion				-0.039	-0.035	-0.034	-0.032		
				0.000	0.001	0.002	0.004		
Highest qualification father					0.089	0.054	0.053		
					0.000	0.000	0.000		
Highest qualification mother						0.051	0.046		
						0.000	0.001		
Mother employed							0.075		
							0.029		
NObs	1,144	610	1,144	1,144	874	799	785	**610**	**610**

!Heteroscedasticity-robust estimates of standard errors.
All regressions include a set of time/wave dummies.

Table 9 Germany - Relationship between Parental Income per head and Tertiary Education attendance after completion of secondary education. Linear Probability model. Marginal effect of parental income increment of 33 percentiles on likelihood of staying on [+ P-values!]. Sample average=0.14

Variable	(1)	Siblings sample (2)	(3)	(4)	(5)	(6)	(7)	**Siblings Household FE (8)**	**Siblings Household FE (9)**
Parental Income per head	**0.079**	**0.075**	**0.077**	**0.063**	**0.030**	**0.031**	**0.038**	**-0.010**	**0.003**
	0.000	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.000**	**0.666**	**0.896**
Female			0.012	0.014	0.015	0.013	0.011		-0.016
			0.363	0.263	0.270	0.352	0.438		0.403
Position among siblings			-0.038	-0.024	-0.014	-0.013	-0.015		-0.035
			0.000	0.006	0.137	0.182	0.137		0.013
Age of sec. educ completion				0.059	0.056	0.058	0.057		
				0.000	0.000	0.000	0.000		
Highest qualification father					0.052	0.047	0.045		
					0.000	0.000	0.000		
Highest qualification mother						0.012	0.014		
						0.062	0.032		
Mother employed							-0.026		
							0.076		
NObs	2,687	1,545	2,687	2,687	2,298	2,200	2,191	1,545	1,545

!Heteroscedasticity-robust estimates of standard errors.
All regressions include a set of time/wave dummies.

Table 10 Hungary - Relationship between Parental Income per head and Tertiary Education attendance after completion of secondary education. Linear Probability model. Marginal effect of parental income increment of 33 percentiles on likelihood of staying on [+ P-values!]. Sample average=0.28

Variable	(1)	Siblings sample (2)	(3)	(4)	(5)	(6)	(7)	**Siblings Household FE (8)**	**Siblings Household FE (9)**
Parental Income per head	**0.163**	**0.193**	**0.162**	**0.162**	**0.109**	**0.074**	**0.051**	**0.184**	**0.207**
	0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.013**	**0.105**	**0.014**	**0.004**
Female			0.092	0.091	0.088	0.053	0.066		0.118
			0.016	0.016	0.032	0.213	0.116		0.082
Position among siblings			-0.048	-0.067	-0.046	-0.031	-0.037		-0.174
			0.308	0.154	0.350	0.532	0.455		0.009
Age of sec. educ completion				-0.045	-0.039	-0.040	-0.036		
				0.000	0.004	0.004	0.011		
Highest qu father					0.075	0.042	0.044		
					0.000	0.020	0.015		
Highest qualification mother						0.071	0.064		
						0.000	0.002		
Mother employed							0.158		
							0.002		
NObs	541	197	541	541	424	396	388	**197**	**197**

!Heteroscedasticity-robust estimates of standard errors.
All regressions include a set of time/wave dummies.

Table 11 Poland - Relationship between Parental Income per head and Tertiary Education attendance after completion of secondary education. Linear Probability model. Marginal effect of parental income increment of 33 percentiles on likelihood of staying on [+ P-values!]. Sample average=0.12

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	**Siblings Household FE (8)**	**Siblings Household FE (9)**
Parental Income per head	**0.070**	**0.062**	**0.070**	**0.070**	**0.045**	**0.039**	**0.037**	**0.032**	**0.030**
	0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.017**	**0.024**
Female			0.041	0.041	0.039	0.040	0.040		0.032
			0.000	0.000	0.001	0.001	0.001		0.034
Position among siblings			-0.012	-0.012	-0.003	-0.002	-0.002		0.017
			0.157	0.157	0.766	0.834	0.815		0.133
Age of sec. educ completion				0.001	0.003	0.004	0.004		
				0.869	0.477	0.235	0.223		
Highest qualification father					0.078	0.057	0.057		
					0.000	0.000	0.000		
Highest qualification mother						0.044	0.043		
						0.000	0.000		
Mother employed							0.016		
							0.186		
NObs	3,206	1,927	3,206	3,206	2,779	2,718	2,715	**1,927**	**1,927**

!Heteroscedasticity-robust estimates of standard errors.
All regressions include a set of time/wave dummies.

Table 12 The UK -Relationship between Parental Income per head and Tertiary Education attendance after completion of secondary education. Linear Probability model. Marginal effect of parental income increment of 33 percentiles on likelihood of staying on [+ P-values!]. Sample average=0.27

Variable	(1)	Siblings sample (2)	(3)	(4)	(5)	(6)	(7)	**Siblings Household FE (8)**	**Siblings Household FE (9)**
Parental Income per head	**0.090**	**0.081**	**0.091**	**0.090**	**0.084**	**0.077**	**0.075**	**0.070**	**0.062**
	0.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.016**	**0.033**
Female			0.050	0.052	0.062	0.060	0.058		0.046
			0.019	0.015	0.017	0.021	0.026		0.165
Position among siblings			-0.030	-0.033	-0.012	-0.025	-0.022		0.030
			0.094	0.061	0.594	0.267	0.329		0.260
Age of sec. educ completion				-0.031	-0.034	-0.037	-0.036		
				0.000	0.001	0.000	0.000		
Highest qualification father					0.056	0.033	0.032		
					0.000	0.000	0.001		
Highest qualification mother						0.078	0.078		
						0.000	0.000		
Mother employed							0.025		
							0.452		
NObs	1,580	893	1,580	1,580	1,103	1,011	1,007	893	893

!Heteroscedasticity-robust estimates of standard errors.
All regressions include a set of time/wave dummies.

Table 13 All countries - Relationship between the level of Parental Income and Tertiary Education attendance after completion of secondary education. Linear Probability model. Marginal effect of parental income increment of 33 percentiles on likelihood of staying on [+ P-values!]. Only coefficient of Parental Income reported.

Country	(1)	Siblings sample (2)	(3)	(4)	(5)	(6)	(7)	**Siblings Household FE (8)**	**Siblings Household FE (9)**
Belgium	0.077	0.064	0.077	0.077	0.014	0.003	-0.004	0.006	0.003
	0.000	0.004	0.000	0.000	0.450	0.896	0.858	0.893	0.936
Germany	0.061	0.046	0.070	0.057	0.035	0.036	0.042	-0.013	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.521	0.990
Hungary	0.141	0.179	0.145	0.142	0.083	0.065	0.052	0.172	0.201
	0.000	0.000	0.000	0.000	0.005	0.040	0.111	0.037	0.013
Poland	0.052	0.044	0.054	0.054	0.034	0.027	0.025	0.030	0.028
	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.025	0.038
UK	0.085	0.076	0.088	0.086	0.085	0.075	0.074	0.053	0.047
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.074

List of regressors identical to those used in Tables 8-12

Conclusion

According to Carneiro & Heckman (2002), the observed correlation between family income and tertiary education attendance or completion can be conceptually interpreted as arising from two different sources: short-term liquidity constraints or long-term family or ability effects. This paper, using a sibling fixed effect model, produces evidence For Belgium, Germany, Hungary, Poland and the UK that the latter are quantitatively very important in some countries.

Our results suggest the absence of (short-term) parental -income effect on attendance in Belgium and Germany. We find a small positive effect for Poland: a one tertile (33%) increment in family income results in a 3 percentage-point increment in tertiary education attendance. For the UK the effect is greater, reaching more than 6 percentage points. This is higher than the 3.3 percentage points obtained by Blanden & Gregg (2004), who compiled very similar data[5], but focussed on graduation rather than attainment. Finally, we find a strong positive effect for Hungary, where a tertile increment along the income distribution generates a jump of 20 percentage points in attendance rate. However, this last result is obtained with a very small number of siblings.

For Belgium and Germany, these results indicate that factors influencing tertiary education attendance (and maybe also completion/graduation) can probably not be offset by additional financial aid to prospective student's families (student allowances, tax credits, grants...)[6]. Similarly, our results indicate that deviating from the current low-tuition-fees practice[7] is extremely unlikely to dramatically affect enrolment and attainment across socio-economic segments of Belgian or German youth.

For Poland, the UK and Hungary -- where parental income seems to have a positive causal effect -- there seems to be justification for maintaining and reinforcing existing schemes. Nonetheless, one should bear in mind that an annual increase of 33% in *net* income represents a considerable sum of money. Budgets needed to achieve transfers of this magnitude probably go well beyond the income redistribution obtained via existing financial aid to families with student children, or to students themselves.

Possible implications are that there is a need to explore different strategies for enhancing access to tertiary education. According to Carneiro & Heckman's recent work on policies for human capital (Carneiro & Heckman, 2002), it seems that financial aid is more productive at an earlier stage of a child's education career. Carneiro & Heckman argue that the US evidence points to a high return on early

5 BSPH is the prime source of data in CHER for the UK.

6 This is in line with the results of a recent paper that evaluates the effect of better student aid on enrolment into German universities (Baumgartner & Steiner, 2006).

7 For a discussion of the distributional characteristics of tuition fees, deferred and/or income contingent tuitions fees vs. finance by taxation see Vandenberghe & Debande (2007).

interventions and a low return on remedial or compensatory interventions later in the life-cycle. Education being extremely cumulative, it makes *a priori* sense to focus on the determinant of primary and secondary education outcomes. It should be remembered that our results are all based on individuals who have completed secondary education. The potential effect of parental money on early attainment was thus beyond the scope of this study.

Finally, it is worth stressing that our analysis treats tertiary education as a *homogeneous* good (or service). The basic question we ask in this paper is whether "more or less parental money around the age of 18 makes young people more likely to stay on beyond secondary education". One could argue that most young people who have completed secondary education at least attempt to attend some post-secondary program. But, as suggested by Hoxby (2006), there is enormous variation in the sorts of institutions they can attend, the curricula to which they are exposed, the location and also the prestige of the institutions they select, and the return they eventually make on their investment. It is thus perhaps a little naive to expect that parental income variation will mainly affect attendance in general, as opposed to "which institution" or "which degree" is chosen. There is, moreover, evidence to suggest that vertical differentiation amongst institutions and fields of study is nowadays important. In most countries, tertiary education is relatively heterogeneous (Naylor, Smith & McKnight (2002).

Another related issue is that the cost of tertiary education attendance might not necessarily force poorer families to renounce their human capital investment. Nonetheless, it might still impose severe and painful budget reallocations (no holiday abroad this year...). An interesting issue, requiring additional research, would be to look at welfare inequality amongst families with children in tertiary education.

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