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Social stratification and out-of-school learning

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Social stratification and out-of-school learning

Christian Andersson
Per Johansson

WORKING PAPER 2009:17

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Social stratification and out-of-school learning^{*}

by

Christian Andersson^{*} & Per Johansson[♦]

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Abstract

To study effects of out-of-school learning we use data on boarding home pupils who attended elementary public schools in the 1940's. The out-of-school environment at the boarding homes could be considered being more learner friendly than the home environment on average: the pupils at the boarding homes had daily scheduled time for doing their homework under assistance of a junior school teacher and, in addition, they had access to a small library. The placement at boarding homes was based on the distance to the nearest school and had, thus, no direct connection to pupils' skills which simplifies the empirical analysis based on register data. We find that the more learning friendly environment equalize skills at school leaving age. The effect is larger for kids with low initial ability.

Keywords: pedagogic personal; homework; early interventions

JEL-codes: N34, I2

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1 Introduction

We study the importance of out-of-school environment for scholastic achievement using data on boarding home pupils, born between 1932 and 1941, who attended elementary public schools close to the boarding homes. Furthermore we study effects on the choice of higher education and labor market outcomes. The boarding home pupils had daily scheduled time for doing their homework under the assistance of a qualified teacher as well as access to a small library. The out-of-school environment for boarded children could, on average, be considered as a more learning friendly than the home environment.

This study is closely related to the “summer gap” literature (see e.g. Heyns (1978), Cooper et al. (1996), Fryer and Levitt (2004), Entwisle et al. (2007) and Lindahl (2007)). In this literature, the effects of out-of-school environment on scholastic achievements is studied by making use of the gap in between semester (spring-fall) difference in test scores.^{1,2} The general finding is that the test score gap between advantaged and disadvantaged pupils widens during the summer (between semesters) and that schooling (within semesters) compensates pupils from disadvantageous family backgrounds.³

Our study adds to this literature by providing another way of testing for out-of-school learning environment effects on education but primarily by providing an analysis of the potential long run effects. This study is most similar to the recent study by Entwisle et al. (2007) who estimate cumulative effects of the summer gap. They find that more than half of the difference in ninth grade test scores for pupils from high and low income families can be attributed to the cumulative summer gap effect. These out-of-school summer learning differences are also shown to substantially account for differences

¹ The idea is that advantaged children’s home environments are resource rich (e.g., they have access to books and magazines, that their parents read for them, etc.) which increases these children’s knowledge more in the summer compared to disadvantaged children.

² To some extent, this paper also fits into the literature on effects of pre-school interventions which deals with disadvantaged young children (less than five years of age) (see e.g. Currie (2001) for a review). However, in our study the intervention is not directed toward disadvantaged children and it takes place at the age of six or seven.

³ Fryer and Levitt (2004) is an exception though. The black-white test score difference in math was found to be unchanged over the summer and increased during the school year.

between social groups in high school dropping out rates, high school track placements and four-year college attendance rates.

The main drawback with our study is that the treatment did not only involve a more learning friendly out-of-school environment. The children (some only six years of age) could stay very long periods at the boarding home without seeing their families. The rules at the boarding homes were strict and the children had to do some chores. Being separated from their families could potentially be traumatic for the children and could, thus, have negative effects at the time when boarded, but also later on in life. These potential effects are most likely attenuating any effect from tutoring and extra pedagogical stimuli provided at the boarding homes.

The placement at the boarding homes was based on the distance to the nearest school. However, it is likely that children living further away from school were less skilled than children living closer to the school when they entered first grade. This fact prohibits simple comparisons in mean outcomes between the two groups of pupils. Unfortunately, we lack information on the distances to the nearest school for the non-boarding home pupils; a regression discontinuity approach is thus not possible. Instead we control for skill differences in first grade by means of regression. To this end we have access to fathers and mothers socio-economic status, grades in the first semester and the name of the pupil's school. This allows us to perform extensive sensitivity checks and also allows us to use within school variation in the estimations.

Our results suggest that the out-of-school learning has positive effects on student achievement. Staying six years or longer at the boarding homes has the effect of raising grade point average, GPA, in sixth grade by 6 percent on average. There is no evidence on long-run effects: educational attainment and earnings are all unaffected by staying at the boarding homes. Interestingly, we find larger boarding home effects for children with low GPA in the first semester. Consistent with this, there are some indications of long-run increases in educational attainment and earnings for those with low GPA in the first semester. For those with low initial skills the positive effects from tutoring, books etc. thus outweigh the negative effects from being separated from the home environment.

The rest of the paper has the following structure. Section 2 describes the boarding homes. Section 3 presents the data and variable definitions. Section 4 provides a first descriptive look at the data and section 5 the estimation results. The paper is concluded in section 6.

2 Norrbotten County and the boarding homes⁴

In the early twenties century Sweden was not a rich county (cf. e.g. Maddison 2001). This was especially true for the Norrbotten County, a county bordering Finland in the north, where the boarding homes were situated. The total fertility rate (TFR) in 1900 was 6.02 children per women (SCB 1999). This can be contrasted with a TFR of 4.03 for Stockholm County but also with the TFR of 6.02 in Yemen 2000-2005⁵. In 1930, when our study population are born, the TFR of Norrbotten and Stockholm was 3.46 and 1.70, respectively. This is in parity with the 2000-2005 TFR of Syria or Paraguay. In the 1960's TFR was the same in Stockholm and Norrbotten and Sweden was also one of the countries in the world with the highest GDP (cf. e.g. Maddison 2001). Given the observed negative association between GDP and TFR across countries⁶ we believe that it's reasonable to assume that the economic condition in Norrbotten County was worse than in Stockholm and also close to the situation of the developing countries of today.

Also the level of education was low in the County. From 1848 to 1958 the compulsory education in Sweden was organized locally.⁷ This meant that the quality of teaching and the number of years and number of days in a year which the children actually attended school could vary across the country. The general pattern in the first half of the twenties century was that both the quality and quantity of schooling was better in cities than on the country side and that the quality and quantity of schooling was decreasing with the distance from the capital, Stockholm (SCB 1974).

⁴ This section draws heavily on Slunga (1993, 2000) and Lundemark (1980).

⁵ United Nations, Department of Economic and Social Affairs, Population Division (2007). World Population Prospects: The 2006 Revision, Highlights, Working Paper No. ESA/P/WP.202.

⁶ see e.g. CIA World Fact Book.

⁷ In 1903, 7 percent of children aged 7-14 in Norrbotten County did not however receive any schooling. The corresponding figure for Sweden as a whole was 3 percent.

In 1902 and in 1903, the crops in the northern part of Sweden failed and this resulted in severe famine. As a consequence, a special type of after-school centers (“arbetsstugor”) was established in Norrbotten County in which children were boarded. From here on we denote these centers boarding homes. The primary goal of the boarding homes was to relieve children from acute poverty. However, they were soon seen as a solution to the problem that many children did not receive any schooling because of the long distances and poor roads between homes and schools.

The children at the boarding homes attended regular schools situated close to the boarding homes. Schools were supposed to provide formal education, while the boarding home were to give children food and lodging, but should also see to the upbringing and development of the children by making them used to work, tidiness and obedience.

The boarded children had scheduled time for homework after school and from the mid 1930's it was required that the directress of the boarding home had a primary school certificate or having a junior primary school teacher education.⁸ Every boarding home had their own small library, where pupils could borrow books. The availability of books must have been exceptional at this time in Norrbotten County.

The importance of the boarding homes for the schooling of children in this part of Sweden can be exemplified by the, in total, 570 children that stayed at a boarding home in the academic year of 1931/32. None of them would have obtained the eight months of statutory schooling per year if they would have continued to live with their parents. About a third of the children would have missed all schooling unless other possibilities would have been possible, for instance boarding in private homes.

Most children came to the boarding home at the age of seven and stayed there for their complete period of elementary schooling. In the beginning, the boarded children spent eight month per year at the boarding home. In the academic year of 1939/40, the time at the boarding home was extended to nine months per year. Most children only visited their parents during the summer and Christmas holidays.

⁸ Memo regarding terms of employment, 1935-08-15, *Folkkrörelsernas Arkiv*, 1018, Vol. 120, EVIb.

2.1 Schooling and organization

Starting in 1935, the boarding homes were funded by government grants. The grant was subject to the proviso that the children's home was located at least four kilometers from the nearest school.⁹

There was a strong drive to centralize school units in the 1940's, which implied an increased requirement to transport or board children living far away from schools. The slow transition (starting in 1936) from a six years of compulsory schooling to seven years contributed to this development (SOU 1945:60, p. 14-15).¹⁰ However, along with the improvement of the economy and the construction of new and better roads the, transportation became more common among children living far away from schools.¹¹ Nevertheless, around 5,000 individuals in the Norrbotten County lacked an accessible road to their homes so there still was a need for boarding.

To obtain an overview of how boarded or transported children were affected both physically and mentally, a small survey was distributed to teachers that taught both boarded and transported pupils in 1949. The survey contained questions about the pupil's general health, peer relations and performance in school. Teachers were also asked about their opinion on which centralization measure they thought were best for the pupils' performance. Of the 42 teachers who answered the survey, two thirds considered boarding preferable. Children at the boarding homes were considered to be exposed to less stress and well cared for with regular habits concerning meals and rest, which made them less tired than the rest of the children, especially at the end of the semester. The scheduled time for homework was emphasized as extra beneficial. At the same time it was pointed out that children who lived with their parents had better psychical health than the children at the boarding homes.

Originally, the government considered the boarding homes as important for the gradual implementation of the nine year compulsory school.¹² However, more schools

⁹ Memo regarding the basis for government grants for boarding home pupils, 1936-01-16, *Folkkrörelsernas Arkiv*, 1018, Vol. 120, EVIb. Prior to 1935, the government grant was targeted at non-Swedish speaking children; the idea was to assimilate Finnish speaking children into the Swedish society.

¹⁰ In the mid 1940's, only around 70 percent of the children attended schooling for seven years or more.

¹¹ In the academic year of 1939/40, 46.5 percent of the number of transported or boarded pupils were transported. In the academic year of 1948/49 this share had increased to 74 percent.

¹² The compulsory schooling has been nine years for all children since 1972.

than expected were built and the rapid development of new and better roads made it possible to transport more children to schools, which implied that the interests for boarding children gradually decreased. After the academic year of 1953/54, the *Foundation of the Norrbotten Boarding homes* finally decided to close down the remaining 15 boarding homes. Seven of the boarding homes examined in this paper were closed down in 1954. One boarding home, Nattavaara, was closed down already in 1951. The closure of the boarding homes implies that children born in 1941 could attend the boarding home for a maximum of twelve semesters.¹³

3 Data and variable specifications

The population of interest in this study consists of individuals born between 1932 and 1941. The choice of cohorts implies that the oldest individuals started elementary schooling in the academic year of 1939/40 and the youngest individuals in the academic year of 1948/49. The population is divided into two groups; those who attended the boarding homes (the treatment group) and those who did not (the comparison group).

All individuals in the treatment and comparison group attended one of eight schools in four different municipalities in the Norrbotten County (see Figure 1 for the location of the municipalities).¹⁴ Information on all pupils from the eight schools is collected from each municipality's school archive. Information about the pupils is collected from handwritten year books, where teachers kept the daily records of the pupils at the school. From these year books we have information on the pupil's name, date of birth, place of residence, if they had to repeat first grade and grades in all subjects they were taught and parents' names. Grades are available in the handwritten books for all semesters, but we have chosen to cull the grades in the first and the twelfth semesters only. In order to calculate grade point averages, GPA:s, the letter based grades have been transformed to numeric values. For three subjects there are a few missing values

¹³ Between the years 1903 and 1954 5,484 children attended one of 20 boarding homes in Norrbotten County.

¹⁴ The four municipalities are; Gällivare, Haparanda, Pajala and Övertorneå. The eight boarding homes and schools which are observed were located in: Hedenäset, Karungi, Nattavaara, Pajala, Pålhem, Svanstein, Ullatti and Vojakkala.

and in these cases these subjects are disregarded when calculating individual GPA:s (see Appendix A for details).¹⁵

We construct three different GPA:s. The first, *GPACA*, is intended to measure cognitive skills: it is the average of the grades in (i) *Mathematics*, (ii) *Writing and language* and (iii) *Speech and reading exercises* which were taught during the entire period of elementary schooling. The second, *GPASA*, is intended to measure social skills and is the average of the grades in (i) *Order* and (ii) *Conduct*. The last, *GPAA*, is the average of the grades in the rest of the subjects that were taught.¹⁶

Boarding home pupils are identified from “*Folkrörelsernas*” archive in Luleå. The archive maintains the original registers from the boarding homes. Information about pupils’ names, date of birth, name and occupation of their parents, home district, and in which semester they first arrived at the boarding home is collected from these handwritten registers. Information about the number of semesters that children stayed at the boarding home and information on distances to the nearest school and the nearest boarding home is also collected. This last information is unfortunately only available for a sub-set of all individuals. Distances to the nearest school are available for 379 individuals out of the total number of 428 boarding home individuals. Distances to the nearest boarding home are available for 338 individuals.¹⁷

¹⁵ Grades are missing for six individuals in gymnastics, seven in handicraft and 21 in singing. We have performed sensitivity analyses where we have imputed missing grades with mean grades and the inference performed is robust to these two ways of handling partly missing grades.

¹⁶ In first semester, *GPAA* contains the following subjects: (i) *Religion*, (ii) *Local geography, history and folklore*, (iii) *Handwriting*, (iv) *Gymnastics*, and (v) *Singing*. In sixth grade the children were also taught the following subjects; (i) *Science*, (ii) *History*, (iii) *Drawing*, (iv) *Handicraft*, and (v) *Geography*.

¹⁷ The reason for missing information on distances for some pupils is most likely due to differences in the administration by the directress of the boarding homes, where some were less thorough in registering the distance than others. Based on the information on place of residence it is possible to impute the distance for most of the pupils, for which information on distances is missing. From this we can see that they actually had four kilometers or more to the nearest school. This will be discussed in more detail in section 4.

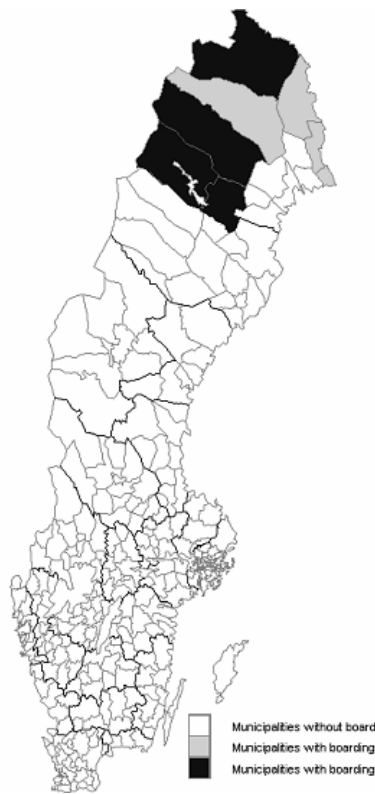


Figure 1. Municipalities with boarding homes marked in grey and black. Grey areas are municipals with boarding homes that are used in this paper

The eight included schools are small with mean pupil cohorts of about 30. The share of boarding home pupils varies across the schools. In the school with the largest share, Pålkem, more than half of the pupils are boarding home pupils. In the school with the lowest share, Pajala, 17 percent of the pupils are boarding home pupils (see Table B 1 in Appendix B).

The total number of individuals is rather evenly distributed over the sample period. However, since transporting children to school becomes more common over time, the boarding home pupils are more frequent in the earliest years (see Table B 2 in Appendix B). Thus, the boarding home individuals are, on average, older than the comparison group pupils.

We have information on the date of birth as well as children's names. Using the date of birth as well as individuals' names, *Statistics Sweden* could retrieve the personal

identifier for more than 90 percent of all individuals.¹⁸ Using the personal identifier, information on family background, educational attainment, annual earnings and marital status, was matched on to the data. There are two reasons why it is not possible to find all individuals. First, it is not possible to find an individual who died before 1947 or after 2003. Second, individuals who have emigrated from Sweden is not registered in the *Statistics Sweden* database.

The final sample contains 1,457 individuals (born between 1932 and 1941) attending the eight schools; 428 individuals attended one of the boarding homes.

To obtain information on the pupils' family background, the *Multigenerational register* ("*Flergenerations-registret*"), has been used. This register contains information on both biological mothers and fathers of individuals born after 1932 and registered as living (at any time) in Sweden from 1961 and onwards.

From the population censuses in 1960 and 1970, "*Folk- och Bostadsräkningarna*", we obtain information on socio-economic status as well as educational level of parents. The socio-economic status is based on individuals' occupation and it is divided into twelve categories. Information on marital status, citizenship, municipality and parish is measured at the end of 1968 and is collected from the population register, "*Registret över totalbefolkningen*". Information on educational attainment in 1990, 1995 and 2006 is collected from the Swedish Register of Education, "*Utbildningsregistret*". Annual earnings and wealth in 1968, 1978, 1988 and 1998 are taken from the income and tax register, "*Registret över inkomster och taxeringar*".

4 Descriptive statistics and some first evidence

In section 4.1 we describe the observed family background for the two groups of pupils and in section 4.2 we describe the observed individual characteristics for the two groups of pupils.

¹⁸ The registers at *Statistics Sweden* only contain information on individuals who are alive and living in Sweden. Therefore, we also used the *Swedish Death Index 1947-2003*, which contains individuals that deceased during 1947 to 2003. This register has been put together by *The Federation of Swedish Genealogical Society*.

4.1 Family background

Unfortunately, all variables are measured after the pupils started their elementary education (1939-1948): socio-economic status is measured in 1960; earnings, wealth and marital status in 1968; and educational attainment in 1970. Since adult education at this time was extremely rare the educational attainment in 1970 is, however, most likely a correct measure of parents' education in 1939-1948.

Table 1. Socio-economic status (SEI) of parents in 1960

SEI	BH fathers		Comparison fathers		BH mothers		Comparison mothers	
	Obs.	Percent	Obs.	Percent	Obs.	Percent	Obs.	Percent
1	82	28.5	135	19.3	108	34.5	151	19.0
2	59	20.5	62	8.8	55	17.6	54	6.8
3	6	2.1	53	7.6	5	1.6	58	7.3
4			9	1.3			7	0.9
5			1	0.1	1	0.3		
6	5	1.7	66	9.4	7	2.2	90	11.3
7	70	24.3	218	31.1	53	16.9	195	24.5
8			17	2.4	2	0.6	56	7.0
11			2	0.3				
12	66	22.9	138	19.7	82	26.2	185	23.2
Total	288	100	701	100	313	100	796	100

Notes: BH = boarding home. SEI codes are: 1: Entrepreneur in farming or forestry, 2: Worker in farming or forestry, 3: Entrepreneur in industry, trading, transport or service occupations, 4: Entrepreneur in "free" occupations, 5: Business executives (employed), 6: Civil servant, salaried employees, 7: Blue collar workers (other than category 2), 8: Employees in service occupations, 10: Not identifiable, 11: Student, 12: Not employed or student.

The distributions of the socio-economic status (SEI) for mothers and fathers in 1960 by treatment group are shown in Table 1. Under the (plausible) assumption that mobility between socio-economic statuses is low we can conclude that both mothers and fathers of the boarding home pupils are overrepresented in the group of farming and forestry entrepreneurs (SEI = 1). This group is likely to consist of quite poor families that in most cases lived from a small piece of land that they cultivated. The parents of the boarding home pupils are also overrepresented in the socio-economic group of workers in farming and forestry (SEI = 2) and they are also more often non-employed (SEI = 12) compared to the comparison group. The parents to the comparison pupils are more frequent in the socio-economic groups of entrepreneurs in industry, trading or service occupations (SEI = 3) and of civil servants and blue collar workers (i.e., SEI = 6 and 7). They are also more often employed in service occupations (SEI = 8) than the parents of the boarding home pupils. All in all, this picture points in the direction that

parents of boarding home pupils, in general, belonged to lower socio-economic groups than parents of pupils in the comparison group.

We have calculated the distribution of the educational attainment for pupils' parents, in 1970. Unfortunately; the information on parents' education are often missing. However, from the available information we can conclude that no boarding home pupils' parents have more than nine years of (compulsory) schooling, while 14 percent of the parents to the comparison group have more than nine years of (compulsory) schooling (see Table B 3 in Appendix B for details). Hence, it is evident that the educational level of the comparison pupil's parents is higher than that of the boarding home pupil's parents.

Table 2. Wealth, earnings and marital status of parents in 1968

	<u>Boarding home</u>		<u>Comparison</u>	
	<u>Obs.</u>	<u>Mean (st. dev)</u>	<u>Obs.</u>	<u>Mean (st. dev)</u>
			Wealth	
Fathers	239	6,175 (67,359)	622	39,359 (230,652)
Mothers	213	495 (5,100)	535	16,370 (116,898)
			Earnings	
Fathers	239	93,012 (57,406)	622	108,661 (104,988)
Mothers	213	39,017 (29,629)	535	56,668 (57,406)
			Married = yes	
Fathers	192	83.5%	544	90.2%
Mothers	188	67.1%	544	71.9%

Notes: Standard deviations (st. dev) within parentheses. Wealth and earnings are in 2006 years Swedish kronor (SEK) (USD 1 \approx SEK 7.5).

Table 2 presents wealth, annual earnings, and marital status in 1968 for the two groups of parents. On average, parents of the boarding home pupils have less wealth, earn less, and are married to lower extent than the parents of the comparison pupils.¹⁹ It is evident that the socio-economic background of the boarding home group is worse than the comparison group.

4.2 Individual variables

The distribution of distances to the nearest school for the boarding home pupils is displayed in Table 3. We see that the four kilometer limit for being allowed admission to the boarding homes was strict. Only about three percent of the boarding home individuals had a distance to the nearest school that was less than four kilometers. No

¹⁹ It should be noted that most parents have zero wealth and that the median wealth is zero for both groups.

one had a distance that was less than three kilometers to the nearest school. A majority of boarding home individuals had a distance to school that was between four and ten kilometers. The rest of the individuals are quite evenly distributed up to a distance of 30 kilometers. One can also note that many pupils had very long distances to the nearest school. More than 20 percent of the pupils had more than 20 kilometers to the nearest school.

We have compared the individuals with observed distances to the nearest school with those that have missing information on distance with respect to grades (see below), parents' earnings and socio-economic status. The results from this exercise show small, and no statistically significant (10 percent level), differences between the two groups. The same exercise has been carried out for the group with three kilometers (12 individuals) to the nearest school. We find weak evidence (not statistically significant) of negative selection. We do not know of the reason why individuals with only three kilometers to school were admitted to the boarding homes. Four of the individuals with three kilometers have boarding home peers in the same home village with four kilometers; hence the distance rule seems to have been strict. However, we cannot rule out that there might have been a few exceptions because of poverty.

Table 3. Distance to the nearest school for boarding home pupils

<u>Kilometers</u>	<u>Observations</u>	<u>Percent</u>
0 – 2	0	0
3	12	3.2
4 – 5	108	28.5
6 – 10	113	29.8
11 – 15	25	6.6
16 – 20	36	9.5
21 – 25	23	6.1
26 – 30	34	9.0
31 – 35	9	2.4
36 – 40	12	3.2
41 >	7	1.8
Total	379	100

Note: For 49 boarding home individuals (about 13 percent) there is no information on the distance to the nearest school. Originally the number of missing values was 136, but based on the information on place of residence we have imputed distances to the nearest school for 87 individuals.

Since the number of boarding homes was restricted, the distances to the nearest school for the children is not always the same as the distance to the nearest boarding home, where the child actually was boarded. The Distances to the nearest boarding home (not displayed) are in general longer than the distances to the nearest school. Less

than ten percent of the boarding home pupils had less than ten kilometers to their home. This suggests that very few children could meet their parents except for Christmas and summer holidays.

Table 4. Number of semesters at the boarding home by the age when starting

Semesters	Age when starting boarding home								Total	Percent
	6	7	8	9	10	11	12	13		
1-2	4	21	5	2	1	0	3	2	38	9.8
3-4	8	20	2	3	0	1	3	1	38	9.8
5-6	2	19	4	0	2	3	0	0	30	7.7
7-8	9	34	5	3	0	2	0	0	53	13.6
9-10	6	26	2	3	1	0	0	0	38	9.8
11-12	11	48	7	1	0	0	0	0	67	17.2
13-14	15	89	8	1	0	0	0	0	113	29.0
15-16	3	7	2	0	0	0	0	0	12	3.1
Total	58	264	35	13	4	6	6	3	389	100
Percent	14.9	67.9	9.0	3.3	1.0	1.5	1.5	0.8	100	100

Note: Own calculations based on data from *Folkrörelsernas arkiv*. Information on the number of semesters is missing for 39 individuals (nine percent).

Table 4 presents the number of semesters spent at the boarding home by age of entry into the boarding home. We have information on the number of semesters for 389 of the boarding home pupils.²⁰ We can conclude that most pupils entered the boarding home at the age of seven. Most pupils who entered at age six or seven also stayed on the boarding homes throughout their elementary schooling period (see 11-12 and 13-14 semesters). Many pupils, however, left the boarding homes early. We do not know the reason for this. A likely explanation is residential mobility or that they were transported to school instead of being boarded. About half of the boarding home individuals spent more than 5 years at the boarding home. Mean number of semesters spent at one of the boarding homes is almost ten semesters. As a result of the closure of the boarding homes in 1954, the last cohort of pupils (born 1941) could, attend the boarding home for a maximum of twelve semesters.²¹ Some, but far from all, pupils attended seven years of elementary schooling even though the compulsory school attendance at this point in time was seven years. Individuals with 14 semesters at the boarding home are those that continued to seventh grade of elementary schooling or had to repeat grades. The reason

²⁰ We miss information on the number of semesters for 39 boarding home pupils (nine percent). The SEI of these individuals' parents indicates that they are non-employed to a higher degree than the rest of the parents. Hence the shorter stay at the boarding homes may to some extent be from residential mobility caused by unemployment.

²¹ The boarding home in Nattavaara closed down in 1951 (Lundemark, 1980) which imply that individuals born in 1941 could attend this boarding home for a maximum of three years.

that some pupils stayed 16 semesters at the boarding home is that they had to repeat at least one grade.

About five percent of the boarding home pupils had to repeat first grade (see Table 5). The corresponding figure for comparison group pupils is about six percent. The difference in grade repetition is, thus, small and far from being statistically significant. We also note that the fraction of boys is larger in the boarding homes sample than in the comparison sample, but this difference is again not statistically significant.

Table 5. Grade repetition and gender distribution

	Boarding home		Comparison	
	Obs.	Percent	Obs.	Percent
Grade repetition (1 st grade)	22	5.2	61	5.9
Female	196	45.8	494	48.0
Male	232	54.2	535	52.0

Three different indices of GPA:s are calculated for the first semester as well as for the sixth grade of elementary schooling. Unfortunately, grades in sixth grade are only available for four schools (Nattavaara, Pajala, Pålken and Ullatti). Table 6 displays mean GPA:s for each sub-class of skills (cognitive, social and other) for the two groups of pupils. It is clear that GPA in the first semester for the boarding home individuals is lower than for the comparison group on all three accounts.

Table 6. Grade point average (GPA) in the first semester and the end of sixth grade

	Boarding home		Comparison	
	Obs.	Mean	Obs.	Mean
Total population				
GPA (cognitive)- 1 st semester	367	3.29 (0.55)	969	3.39 (0.60)
GPA (social) – 1 st semester	369	6.37 (0.99)	972	6.57 (0.89)
GPA (other) – 1 st semester	367	3.12 (0.39)	969	3.15 (0.41)
Population with grades in 6 th grades				
GPA (cognitive)- 1 st semester	97	3.42 (0.62)	321	3.34 (0.53)
GPA (social) – 1 st semester	97	6.21 (1.02)	322	6.46 (0.99)
GPA (other) – 1 st semester	97	3.19 (0.49)	321	3.08 (0.32)
GPA (cognitive) – 6 th grade	111	3.93 (0.84)	326	3.90 (0.83)
GPA (social) – 6 th grade	111	6.82 (0.64)	326	6.86 (0.61)
GPA (other) – 6 th grade	111	4.03 (0.58)	326	4.07 (0.59)

Note: standard deviations within parentheses.

The differences in cognitive and social skills are statistically significant (p -value < 0.01). But the difference in grades for the other subjects is not statistically significant. When we turn to the sample for which we have data on grades in the sixth grade, the only statistical significant difference is for social skills where, again, the boarding homes pupils have lower GPA. For cognitive and other subjects GPA the boarding

homes do better than the non boarding homes pupils. The boarding home pupils also perform marginally better than the comparison group when it comes to cognitive skills in the sixth grade. On the other two GPA measures they perform marginally worse in the sixth grade.

Our primary measure of treatment will be the number of semesters spent at the boarding homes. Therefore it is important to examine if there are any systematic differences with respect to observed GPA:s and family background across the boarding home semester distribution. In Table 7 we present descriptive statistics by semester. The family background variables are socio-economic status (SEI) in 1960 and earnings in 1968. We have regrouped the SEI code into five new classes. The first group, SEI(1-2), contains parents with SEI code 1 and 2, the second group, SEI(6-7), consist of parents with SEI codes 6 and 7. The third group, SEI(3-5,8,11), consists of parents with the SEI codes 3, 4, 5, 8 and 11. The last group, SEI(12) consists of non-employed parents, i.e. those with SEI code 12. We have also created a group, SEI(M), for those parents where we lack information about socio-economic status. These groups of indicators are created for individuals' fathers as well as mothers. We do not find any statistically significant differences (at risk levels below 10 percent). Nevertheless, we note that those with 1-2 semesters and 13-16 semesters differ somewhat from other boarding home pupils. The earnings of both their fathers and mothers are lower than for the rest of the population. We can also note that pupils with 7-8 semesters have highest cognitive GPA in the first semester. Turning to the GPA:s in the 12th semester, we can see that the boarding home pupils with 3-6 and 11-16 semesters have higher cognitive GPA:s than the comparison pupils.

To further study the selection into boarding homes we have estimated ordinary probit regression models. To study the determinants of the number of semester we have also estimated (OLS) regression models with log number semester as the dependent variable. In these regressions, we include the variables in Table 7 as independent variables (excluding GPA in the sixth grade). When we study the determinants of number of semesters we furthermore include distance to nearest school. The results from these regressions are shown in Table 8.

Table 7. Descriptive statistics by number of semesters at a boarding home

	<u>Comparison group</u>		<u>1-2 semesters</u>		<u>3-4 semesters</u>		<u>5-6 semesters</u>		<u>7-8 semesters</u>		<u>9-10 semesters</u>		<u>11-12 semester</u>		<u>13-16 semesters</u>	
	<u>Obs.</u>	<u>Mean</u>	<u>Obs.</u>	<u>Mean</u>	<u>Obs.</u>	<u>Mean</u>	<u>Obs.</u>	<u>Mean</u>	<u>Obs.</u>	<u>Mean</u>	<u>Obs.</u>	<u>Mean</u>	<u>Obs.</u>	<u>Mean</u>	<u>Obs.</u>	<u>Mean</u>
GPA (cognitive) 1 st semester	969	3.39	30	3.36	31	3.30	21	3.25	45	3.49	31	3.09	56	3.37	121	3.26
GPA (social) 1 st semester	972	6.57	31	6.42	31	6.42	21	5.86	46	6.39	31	6.22	56	6.43	121	6.44
GPA (other) 1 st semester	969	3.15	30	3.06	31	3.15	21	3.06	45	3.23	31	2.92	56	3.25	121	3.12
GPA (cognitive) 6 th grade	326	3.90	5	3.20	5	4.09	4	4.11	12	3.76	12	3.64	26	3.99	46	4.06
GPA (social) 6 th grade	326	6.86	5	6.60	5	7.00	4	7.00	12	6.67	12	6.67	26	6.77	46	6.91
GPA (other) 6 th grade	326	4.07	5	3.44	5	4.30	4	4.03	12	3.72	12	3.89	26	4.12	46	4.13
Father																
SEI(1-2)	1,029	0.19	38	0.37	38	0.21	30	0.43	53	0.28	38	0.29	67	0.40	125	0.33
SEI(6-7)	1,029	0.28	38	0.24	38	0.42	30	0.13	53	0.17	38	0.13	67	0.13	125	0.14
SEI(3-5,8,11)	1,029	0.13	38	0.11	38	0.05	30	0.10	53	0.15	38	0.18	67	0.10	125	0.20
SEI(12)	1,029	0.08	38	0.00	38	0.00	30	0.00	53	0.02	38	0.05	67	0.00	125	0.02
SEI(M)	1,029	0.32	38	0.29	38	0.32	30	0.33	53	0.38	38	0.34	67	0.36	125	0.30
Earnings (1968)	622	14,416	23	11,620	25	15,466	19	14,027	25	11,384	21	13,340	38	13,513	66	11,393
Mother																
SEI(1-2)	1,029	0.19	38	0.37	38	0.21	30	0.43	53	0.28	38	0.29	67	0.40	125	0.33
SEI(6-7)	1,029	0.28	38	0.24	38	0.42	30	0.13	53	0.17	38	0.13	67	0.13	125	0.14
SEI(3-5,8,11)	1,029	0.13	38	0.11	38	0.05	30	0.10	53	0.15	38	0.18	67	0.10	125	0.20
SEI(12)	1,029	0.08	38	0.00	38	0.00	30	0.00	53	0.02	38	0.05	67	0.00	125	0.02
SEI(M)	1,029	0.32	38	0.29	38	0.32	30	0.33	53	0.38	38	0.34	67	0.36	125	0.30
Earnings (1968)	535	7,518	19	5,044	16	5,641	12	5,439	27	5,218	23	5,106	37	6,200	53	5,183

Table 8. Selection into boarding homes

	Boarding homes (Probit)		ln(# semesters) (OLS)		
	(1)	(2)	(3)	(4)	(5)
Intercept	-.16 (.46)	-.21 (.88)	2.37*** (.36)	2.68*** (.43)	1.53*** (.69)
Socio-economic status of parents; reference category SEI(3-5,8,11)					
Mother					
SEI(1-2)	.47*** (.18)	-.22 (.76)	.15 (.13)	-.08 (.13)	.79*** (.38)
SEI(6-7)	-.56*** (.18)	-1.01 (.68)	.31* (.19)	.03 (.18)	2.08*** (.55)
SEI(12)	-.88*** (.29)	-2.15*** (.74)	.10 (.20)	-.39 (.36)	-.27 (.39)
SEI(M)	.01 (.13)	.28 (.71)	.03 (.12)	-.06 (.10)	----
Father					
SEI(1-2)	.01 (.20)	.87 (.75)	-.21 (.13)	-.10 (.13)	-1.05*** (.35)
SEI(6-7)	.38** (.19)	1.14 (.67)	-.35** (.18)	-.07 (.16)	-2.34*** (.53)
SEI(12)	-.11 (.29)	1.03 (.75)	-.07 (.16)	.13 (.18)	----
SEI(M)	.04 (.29)	1.15 (.92)	-.06 (.11)	-.04 (.09)	-.78 (.51)
Female	-.00 (.08)	-.01 (.16)	-.15*** (.06)	-.08 (.08)	-.08 (.13)
GPACA	-.27*** (.10)	-.60*** (.21)	-.15 (.10)	-.08 (.12)	-.17 (.21)
GPASA	-.01 (.05)	(-.09)	.02 (.04)	.04 (.04)	.07 (.10)
GPAO	.18 (.14)	.86*** (.32)	.09 (.12)	-.04 (.15)	.38 (.27)
Distance (km)/100	----	----		.50 (.50)	
Income (SEK) mother/10,000		-.24* (.137)			.06 (.09)
Income (SEK) father /10,000		-.06 (.06)			-.08 (.12)
Controls for school and year	Yes	Yes	Yes	Yes	Yes
Observations	1,336	419	335	222	92
Pseudo R ² / R ²	0.16	0.25	0.56	0.50	0.55

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio-economic status consist of five dummy variables for both fathers and mothers.

Columns (1) and (2) give the results from the probit regressions on boarding home. In column (1) we do not control for family income. Boarding home pupils are relatively more likely to have mothers working in farming and forestry; their mothers are less likely to be civil servants, blue collar workers (SEI(6-7)), or non-employed (SEI(12)).²² They are also more likely to have fathers working as civil servants or blue collar

²² These statements are all relative to the omitted category, SEI(3-5,8,11), consisting of entrepreneurs, business executives, service industry, or students.

workers (SEI(6-7)). Further, they have lower cognitive GPA:s in the first semester. When we control for the income of the mothers and fathers in 1968 (see column 2) we lose a lot of observations and the precision of the estimates are greatly affected. Now, non-employed mothers in 1960 are overrepresented among the boarding home pupils with observed parental income in 1968. GPA in the first semester on cognitive skills remains negative, but there is also a positive sign for GPA in other subjects. The income of mothers is moderately lower for the boarding homes pupils. Turning to the boarding home sample and the determinants of number of semesters we find very few significant associations. According to column (3), based on 335 boarding home students, the number of semesters increases with 31 percent if the mother is a civil servant or a blue collar worker, SEI(6-7); on the other hand, the number of semester decreases with 35 percent if the father is a civil servant or a blue collar worker. The number of semesters is 15 percent lower for the girls. In column (5), when we also include family income only 92 individuals remain; here we find that mothers and fathers SEI goes in opposite directions and that there are no effects of income on the number of semesters.

All in all: (i) pupils from the boarding homes seem to come from somewhat less advantageous circumstances than the comparison pupils and (ii) we cannot observe any selection of length of stay at the boarding homes.

Educational attainment for the two groups in 1995 is displayed in Table 9. Boarding home individuals, on average, have lower educational attainment than the comparison group. About 42 percent of the boarding home individuals have only compulsory schooling, while the corresponding figure for the comparison group is 35 percent. Also at the other end of the distribution there are differences. The share with university studies is seven percentage points larger for the comparison group than for the boarding home group.

The next outcome variable to be examined is annual earnings or taxable income.^{23,24} We have data on earnings for the years 1968, 1978, 1988 and 1998 which are displayed

²³ Taxable income refers to income which is subject to tax in Sweden. This includes, for example, income from self employment, sickness insurance, unemployment insurance and pensions (old age and early retirement).

²⁴ In an earlier version of this paper we also studied effects on early retirement and mortality. We did not find any differences between the two groups for these variables. Hence, in order to save space, we do not present the results for these variables.

in Table 10. Earnings for the comparison group are higher than for the boarding home pupils at all time points. The income differences for the period 1968-1988 are quite stable at around 20,000 SEK. In 1998, the difference is much smaller and not statistically significant. The most likely explanation for the change in income differences is that some individual have left the labor market in 1998.²⁵ Since income from pensions is a fraction of previous earnings this will imply a reduction in the income difference between the two groups.

5 Analysis and results

We first study the short run effect of boarding by estimating the effect from the number of semesters spent at the boarding homes on GPA in sixth grade (cognitive, social and other subjects separately), thereafter we turn to the long run effects on educational attainment and earnings. We control for year of compulsory school start, gender and school using fixed effects. We include parental variables measured in 1960 and 1968 as control variables, and in some specifications we also control for the, potentially endogenous, first semester grades.

5.1 Short term effects

In this section we analyze the effect of attending one of the boarding homes on pupils' GPA in the sixth grade. Unfortunately we only observe these grades in four schools. However, since there are very small differences in observed covariates between the two groups, we believe that the results on the short term effects can be generalized to the group of boarding home pupils.

Instead of just using a boarding home indicator variable we make use of the information that treatment intensity varies (see Table 2 for the distribution of number of semesters). If there is a learning-friendly out-of-school effect from attending boarding homes, we would expect a monotonously increasing effect from the number of semesters. Even if there is selection into boarding homes, in general, we can use treatment intensity to test for a learning-friendly out-of-school effect.

²⁵ In 1998 the oldest cohort is 66 years of age. In 1998 the mandatory retirement age in Sweden was 65 years of age, also, 31 percent in our sample was on early retirement schemes in 1998.

Table 9. Educational attainment by gender and boarding homes in 1995

	Boys										Girls				
	Boarding home		Comparison			Boarding home		Comparison			Boarding home		Comparison		
	Obs.	Percent	Obs.	Percent	p-value	Obs.	Percent	Obs.	Percent	p-value	Obs.	Percent	Obs.	Percent	p-value
Compulsory schooling < 9 years	151	40.4	278	30.3	.00	89	44.7	167	37.1	.07	62	35.4	111	23.8	.00
Compulsory schooling 9 years	7	1.9	47	5.1	.01	2	1.0	16	3.6	.07	5	2.9	31	6.7	.06
Upper secondary max 2 years	134	35.8	309	33.7	.47	57	28.6	115	25.6	.41	77	44.0	194	41.6	.59
Upper secondary 3 years	32	8.6	92	10.0	.41	26	13.1	75	16.7	.24	6	3.4	17	3.6	.89
Univ. <3 years	29	7.8	77	8.4	.70	16	8.0	29	6.4	.46	13	7.4	48	10.3	.27
Univ. >3 years	21	5.6	107	11.7	.00	9	4.5	44	9.8	.02	12	6.9	63	13.5	.02
PhD studies	0	0	6	0.7	.12	0	0	4	0.9	.18	0	0	2	0.4	.39
Total	374	100	916	100		199	100	450	100		175	100	466	100	

Table 10. Earnings by group and gender (in 2006 years SEK)

Boys											Girls						
Boarding home			Comparison			Boarding home			Comparison			Boarding home			Comparison		
Year	Obs.	Mean	Obs.	Mean	<i>p</i> -value	Obs.	Mean	Obs.	Mean	<i>p</i> -value	Obs.	Mean	Obs.	Mean	<i>p</i> -value		
1968	348	128,921 (90,593)	825	149,981 (105,118)	.001	225	161,679 (86,221)	497	184,940 (105,933)	.004	123	68,998 (63,988)	328	97,009 (78,426)	.000		
1978	411	168,850 (176,218)	987	189,037 (232,818)	.010	223	210,721 (139,429)	501	235,386 (233,087)	.001	188	119,183 (152,728)	486	141,257 (181,138)	.013		
1988	397	195,181 (388,238)	965	207,683 (455,076)	.024	213	223,099 (402,693)	485	237,955 (515,972)	.080	184	162,863 (308,748)	480	177,096 (326,824)	.017		
1998	370	214,437 (840,982)	908	219,373 (871,288)	.56	197	243,085 (979,657)	447	248,354 (1 032,093)	.680	173	181,816 (574,753)	461	191,271 (624,031)	.237		

Note: standard deviations within parentheses.

To ensure that the results are not driven by functional form, we classify the number of semesters into three groups: those with two years or less at the boarding home (*BHs*), more than two years but less than six years (*BHm*) and, finally, those with six years or more (*BHl*). The first group of individuals consists of 76 pupils, while group two and three consists of 122 and 191 pupils, respectively. For 39 pupils there is missing information on the number of semesters. These pupils are excluded from this analysis.

The results from the estimations with a complete set of control variables are found in Table 11 (all estimated parameters, with different sets of control variables, are for completeness displayed in Tables B 4-B 6 in Appendix B).

Table 11. The effect of number of boarding home semesters on GPA in the sixth grade (cognitive, social and other)

	(1)	(2)	(3)
	<u>Cognitive</u>	<u>Social</u>	<u>Other</u>
BHs: boarded ≥ 1 semester but ≤ 2 years	-0.391 (0.254)	-0.081 (0.255)	-0.224 (0.253)
BHm: boarded > 2 years but < 6 years	-0.052 (0.164)	-0.051 (0.132)	-0.158 (0.114)
BHl: boarded ≥ 6 years	0.277** (0.136)	0.086 (0.085)	0.170* (0.090)
Controls for grades in first semester	Yes	Yes	Yes
Controls for school and year	Yes	Yes	Yes
Controls for socio-economic status of parents	Yes	Yes	Yes
<i>Observations</i>	417	417	417
<i>R</i> ²	0.35	0.18	0.36

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio-economic status consist of five dummy variables for both fathers and mothers. Interaction terms between these variables are also included in the specifications.

The results suggest a monotonously increasing effect of number of semesters on the cognitive GPA. We find a positive and statistically significant effect on the cognitive GPA for pupils with six years or more at a boarding home. This effect is statistically significant controlling for year, school and SEI status of parents. The estimate in column (1) implies that six years or more at a boarding home would lead to an increase in the cognitive GPA by about 0.28 units or by about 7 percent (0.28/3.90). This effect is of the same magnitude as the difference in GPA's between girls and boys (see Table B 4 in Appendix B). We find no effect from boarding homes on our measure of social skill GPA (see column 2). Still the estimates are monotonously increasing with respect to the number of semesters. One potential explanation for the insignificant results is that this measure of social skill is too crude. However, it is worth noting that the magnitude

of the estimate of the girls dummy is the same as from the cognitive skill GPA measure (see Table B 5 in Appendix B). Hence, the social skill measure is picking up some variation in behavior.

The effect on our GPA measure for other subjects is also monotonously increasing with the number of semester at the boarding homes (see column 3). The effect for those with six years or more at a boarding home is positive and statistically significant (almost at the five percent level). This effect is somewhat smaller than the effect found on cognitive skills.

It is worth emphasizing that the results displayed in Table 11 are not contingent on the inclusion of GPA's in the first semester or not (see columns 3 and 4 in Tables B 4-B 6). If unobserved heterogeneity would have been driving the results issue, we would have expected that adding first semester GPA would have affected the estimate on boarding.

We have seen that there are positive effects from boarding homes on the GPA for pupils with six, or more, years at the boarding home. These results are not contingent on the inclusion of the GPA's in the first semester or not. From Table 8 columns (3)-(5) we can observe that the numbers of semesters are not correlated with initial ability (i.e. GPA in the first semester). Hence there seems to be no sorting on initial ability to the boarding homes or on the number of semester with the boarding home. However, the result of an increasing effect could, potentially, be an effect of endogenous sorting. That is, pupils who gain from boarding stay on while those who do not drop out. It is difficult to discriminate between a pedagogical effect and effects from endogenous sorting.²⁶

Under the hypothesis that the effect from pedagogical stimuli is higher for individuals with low initial skills than for individuals with high initial skills²⁷ then the hypothesis of a pedagogical effect can be tested given that GPA in the first semesters is a good measurement of initial ability. Any differences in effects over the GPA distribution cannot be from dynamic selection since there is no correlation between the

²⁶ However, the families seem to have had little choice, i.e. the placement was the distance to the closest school. Endogenous sorting could potentially stem from geographic mobility. This option is perhaps not so likely either since most of the families were poor, putting economic restrictions on mobility.

²⁷ That is an educational production function that is decreasing with the ability level.

cognitive GPA in the first semester and the number of semesters at the boarding home.²⁸

Table 12 presents heterogeneous treatment effects by initial skill. The effects from all boarding home groups are now positive. The effects on cognitive and other GPA are statistically significant for the boarding home pupils with more than two years at the boarding home and the effects decrease with initial skills. The effect on GPA would have been positive for more than 5 percent of the pupils if staying two years or less at the boarding home (i.e., 5.3 percent of the pupils have less than 2.4 on their cognitive GPA in the first semester which is the cut of value when the effect is getting negative). The effect would have been positive for more than 40 percent of the pupils if staying more than two years, but less than six years (41.3 percent have a cognitive GPA in first semester lower than a cognitive GPA of 3.2). Finally the effect would have been positive for more than 90 percent of the pupils if staying six years or more at the boarding home. (90.3 percent have a cognitive GPA in first semester lower than a cognitive GPA of 4.1).

²⁸ We have also tested for their independence by using a chi-square test and estimated the relationship using non-parametric regressions (Loess). For both set ups, no relationship between initial ability and number of semesters is found.

Table 12. Heterogeneous treatment effects in sixth grade by initial skill

	(1) <u>Cognitive</u>	(2) <u>Social</u>	(3) <u>Other</u>
BHs: boarded ≥ 1 semester but ≤ 2 years	1.082 (1.732)	1.067 (1.555)	0.319 (2.232)
BHm: boarded > 2 years but < 6 years	1.457** (0.666)	0.194 (0.462)	1.510*** (0.385)
BHl: boarded ≥ 6 years	1.653*** (0.569)	-0.065 (0.455)	0.955** (0.425)
BHs \times (GPA – Cognitive)	-0.444 (0.552)	-0.346 (0.510)	-0.162 (0.669)
BHm \times (GPA – Cognitive)	-0.455** (0.214)	-0.071 (0.151)	-0.501*** (0.126)
BHl \times (GPA – Cognitive)	-0.409** (0.165)	0.044 (0.122)	-0.235* (0.123)
GPA – Cognitive skill	0.916*** (0.106)	0.018 (0.087)	0.507*** (0.073)
GPA – Social skill	0.032 (0.038)	0.057* (0.034)	0.020 (0.027)
GPA – Other subjects	-0.134 (0.132)	-0.086 (0.136)	0.094 (0.093)
Female = 1	0.216*** (0.077)	0.281*** (0.062)	0.237*** (0.055)
Controls for school and year	Yes	Yes	Yes
Controls for socio-economic status of parents	Yes	Yes	Yes
Observations	417	417	417
R^2	0.37	0.18	0.38

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio-economic status consist of five dummy variables for both fathers and mothers. Interaction terms between these variables are also included in the specifications.

5.1.1 Sensitivity analyses

There is, at least, one potential source of upward bias in our estimates. Many pupils had Finnish as their mother tongue. If more boarding home pupils had Finnish as their mother tongue compared to the comparison pupils our “value added”-approach may be biased upwards, since initial cognitive GPA (Mathematics, Reading and Writing) may be low just because of poor initial knowledge in Swedish. In order to test for this potential problem we have regressed the number of boarding home semesters controlling for grades in Mathematics only. The effect for the pupils with more than six years at the boarding home is 0.32 and statistically significant at the ten percent level (p -value < 0.9). Hence, we believe that our estimates are not biased because there being more Finish children among the boarding home pupils than among the comparison group.

We have performed several sensitivity checks, which all provide evidence of an effect from boarding on grades. Among others, we have included: (1) models with just a dummy indicator for boarding home; the results are in accordance with those reported in

Table 11 but they are less precise (p -value < 0.2); (2) models where we control for the GPA of all subjects in the first semester, which produces exactly the same results as above; (3) a model with the GPA for all subjects as the dependent variable; the effect, for the pupils with six years or more at the boarding home, is 0.18 (p -value < 0.04).

The descriptive statistics on parental earnings, wealth and SEI codes show that the boarding home pupils came from environments with worse prerequisites than the non-boarded pupils. We have controlled for these observed differences and, in addition, we have also controlled for grades in the first semester. If there are still some unobserved heterogeneity we would expect this unobserved heterogeneity to bias our estimates downwards, hence we would most likely underestimate the effect from boarding (or pedagogic stimuli).

All in all, we have found that there is an effect of boarding on cognitive GPA for those who stayed six years and more the boarding home. We also found that effects of boarding are larger for those with low initial ability (GPA in the first semester). This last effect supports the idea that the estimated average effect is from increased pedagogical stimuli at the boarding homes.

5.2 Long term effects

We first estimate the effect of the number of semesters on educational attainment. We then examine how earnings are affected by the number of semesters at the boarding homes. In these estimations we make use of the complete dataset, thus we do not restrict the estimation to the sub-sample where we observe sixth grade outcomes.²⁹

The distribution of educational attainments for the two groups is displayed in Table 9. Pupils in the comparison group were overrepresented among those with higher education. The results in Table 13 have the same flavor. The ordered probit coefficients for the two groups with less than six years at the boarding home are negative (p -value < 0.001). For the group with more than six years and more the estimate is negative, but not statistically significant at any reasonable level of risk. By and large, these patterns remain when we add more control variables; for the pupils with more than six years at

²⁹ We have repeated the analysis performed below to this restrictive sample and the results from these estimations are qualitatively the same as the results with the complete sample.

the boarding home the effect turns positive, but it is not statistically significant at any reasonable level of risk. Despite the positive effect on GPA for pupils with more six years and more at the boarding home there is no effect on educational attainment. Note that the educational attainment is increasing (p-value < 0.052) for those with more than six years at the boarding homes compared with those who have two years and less.³⁰

Table 13. The effect of the number of boarding home semesters on educational attainment in 1995

	(1)	(2)	(3)	(4)
BHs: boarded \geq 1 semester but \leq 2 years	-0.445*** (0.141)	-0.342** (0.145)	-0.327** (0.148)	-0.369** (0.162)
BHm: boarded > 2 years but < 6 years	-0.491*** (0.115)	-0.323*** (0.119)	-0.291** (0.122)	-0.282** (0.138)
BHl: boarded \geq 6 years	-0.116 (0.090)	-0.025 (0.098)	0.025 (0.102)	0.002 (0.107)
Female = 1		0.181*** (0.061)	0.173*** (0.062)	0.033 (0.068)
GPA (Cognitive) 1 st semester				0.392*** (0.086)
GPA (Social skill) 1 st semester				0.012 (0.043)
GPA (Other) 1 st semester				0.383*** (0.122)
Controls for school, year, age and age ²	No	Yes	Yes	Yes
Controls for socio-economic status of parents	No	No	Yes	Yes
Observations	1,257	1,257	1,257	1,159
Pseudo R ²	0.01	0.03	0.04	0.06

Notes: The table reports the coefficients from an ordered probit. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio-economic status consist of dummy variables for both fathers and mothers together with interactions.

The negative effects for the pupils with less than 6 years at the boarding homes are large. For example; the probability of having less than nine years of education is 41 and 31 percent higher for the two groups (.13/.32 = 0.41 for the group with less than two years at the boarding home and .10/.32 = 0.31 for the other group), the probability of having a university degree with less than 3 years is reduced by 40 and 32 percent for the two groups (-.033/.082 = 0.40 and -.026/.082 = 0.32) and the probability of having a university degrees with 3 years and more are reduced by around 53 and 44 percent for the two groups (.041/.077 = 0.53 and .034/.077 = 0.44).

Again we have performed a number of sensitivity checks. For instance we have considered broader educational groups and we have estimated (OLS) linear regression

³⁰ The p-value < 0.104 when testing for an effect against more than two years but less than six years.

models. These sensitivity checks all yielded the same result: negative effects among the pupils with less than six years of boarding and no effects from boarding for the pupils with six years and more at the boarding home.

Table 14. The effect of the number of boarding home semesters on earnings

	(1)	(2)	(3)	(4)
BHs: boarded ≥ 1 semester but ≤ 2 years	-0.253 (0.180)	-0.167 (0.120)	-0.159 (0.124)	-0.192 (0.129)
BHm: boarded > 2 years but < 6 years	-0.233 (0.155)	-0.261** (0.107)	-0.224** (0.109)	-0.212* (0.121)
BHl: boarded ≥ 6 years	-0.034 (0.118)	-0.017 (0.088)	0.030 (0.092)	0.078 (0.094)
Female = 1				-0.738*** (0.062)
GPA (Cognitive) 1 st semester				0.167** (0.077)
GPA (Social skill) 1 st semester				0.014 (0.038)
GPA (Other) 1 st semester				0.135 (0.100)
Controls for school, year, age and age ²	No	Yes	Yes	Yes
Controls for socio-economic status of parents	No	No	Yes	Yes
Observations	5,075	5,075	5,075	4,676
R ²	0.001	0.535	0.538	0.545

Notes: The earnings regressions have been run on pooled data for the years 1968, 1978, 1988, and 1998. ^aRobust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio-economic grouping consist of five dummy variables for both fathers and mothers. Interaction terms between these variables are also included in the specifications.

Column 1 in Table 14 presents OLS estimates from regressions of log earnings, pooled over the years 1968, 1978, 1988 and 1998 on the number of boarding home semesters for different sets of control variables.³¹ The first thing to notice is that adding control variables do very little to the estimates. The two groups with less than six years at the boarding homes have lower earnings compared with the comparison group. The effects are statistically significant at the 10 percent level for the boarding home pupils with more than two years but less than six years (the larger group) for the model with the full set of control variables (see column 4). The estimated effect for the group with six years and more at the boarding home is positive when we control for the socioeconomic status of the parents as well as when we control for both GPA:s in the first semester and the socioeconomic status of the parents (see columns (3) and (4)). The

³¹ There are a few zero earnings each year. In the estimations we impute a value of 1 for these cases. The results are insensitive to this.

effects are however far from being statistically significant. It may also be worth noticing that the life time income for the pupils boarded for six years or more are around 28 percent higher than the income for the other boarded children.³²

Turning to heterogeneous long term effect results on educational attainment and lifetime earnings are presented in Table 15. There are some evidence of a statistical significant (p -value < 0.05) effect on educational attainment (see column 2) for those boarding home individuals with low grades in cognitive subjects that stayed between two and six years at the boarding home. For these individuals the effect is, on average, positive for pupils with the 12.12 percent lowest first semester cognitive GPA:s (GPA < 2.8). For those with longer periods of boarding the estimate is positive for pupils with the 46.19 percent lowest GPA:s (GPA < 3.3). This estimate is, however, not statistically significant (p -value < 0.25)

From the estimated effects on earnings (see column 2) there are no significant effects from boarding. There is a positive estimate for the boarding home pupils who stayed more than six years at the boarding home, but the effect is not statistically significant (p -value < 0.2).

³² The p -value is < 0.091 for those with less than two years and the p -value is < 0.06 for those with two years but less than six years.

Table 15. Heterogeneous long term effects on educational attainment and earnings

	(1) <u>Educational attainment</u>	(2) <u>Earnings^a</u>
BHs: boarded ≥ 1 semester but ≤ 2 years	-1.679 (1.179)	-0.878 (1.042)
BHm: boarded > 2 years but < 6 years	1.530** (0.737)	-0.358 (0.720)
BHl: boarded ≥ 6 years	0.712 (0.627)	0.618 (0.488)
BHs \times (GPA – Cognitive)	0.384 (0.340)	-0.164 (0.142)
BHm \times (GPA – Cognitive)	-0.551** (0.220)	0.043 (0.213)
BHl \times (GPA – Cognitive)	-0.213 (0.185)	0.206 (0.307)
GPA – Cognitive	0.445*** (0.092)	0.168** (0.081)
GPA – Social skill	0.015 (0.043)	0.016 (0.038)
GPA – Other subjects	0.392*** (0.122)	0.146 (0.101)
Female	0.023 (0.068)	-0.742*** (0.062)
Controls for school, year, age and age ²	Yes	Yes
Controls for socio-economic status of parents	Yes	Yes
<i>Observations</i>	1,159	4,676
<i>R² / Pseudo R²</i>	0.05	0.54

Notes: ^aRobust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio-economic status consist of five dummy variables for both fathers and mothers. Interaction terms between these variables are also included in the specifications. The effect on educational level is estimated using an ordered probit. The effect on earnings is estimated using pooled OLS.

5.2.1 Sensitivity analyses

We have performed extensive sensitivity checks. We have: (1) controlled for the total GPA in the first semester instead of the subdivisions into cognitive skill, social skill and other subjects; (2) estimated regression models with earnings instead of the models with log earnings; (3) estimated models with the number of boarding home semesters and semesters squared. The results above are all robust to these re-specifications.

5.2.2 Summing up

We found no evidence of long term effects from boarding against not being boarded. The boarding home pupils with six years or more have less advantageous family backgrounds than the non-boarded pupils. Despite this difference they obtained no less formal education and no less income (see column (2) in Table 13 and Table 14). Hence the increased pedagogical stimuli could equalize the family background differences. The lack of effects may, hence, potentially be from liquidity constraints or it may,

perhaps, be an effect from reduced demand for future studies stemming from the vocational training at the boarding homes.

In order to test for the potential effects from liquidity constraints we added income and wealth of the mothers and fathers to the regressions, but the results from the regression were basically unaffected. The problem with these estimates is that the sample size is reduced by about two thirds (from 1,159 observations to 393) and hence we cannot exclude the possibility that the results given in Table 12 and Table 13 are from credit constraints.

The interpretation of a no effect because of liquidity constraints is instead supported from the observed positive effect on educational attainment and income for the pupils that were boarded for six years or more when compared to the other boarding home pupils (i.e. with less than six years). From Table 7 and Table 8 we cannot discover any difference with respect to parental background. Thus, it is likely that both groups face the same liquidity constraints with respect to further studies.

Thus, it is likely that this long terms effect stems from the increase in cognitive ability due to the more learning friendly environment at the boarding homes compared to the home environment.

6 Conclusions

This paper examines the effects of a learning friendly environment (tutoring, books and time for homework) in elementary school on grades, educational attainment and earnings. We use data on boarding home pupils, born between 1932 and 1941, who attended regular public schools close to the boarding homes. At these boarding homes pupils had daily scheduled time for doing their homework. The boarding home pupils were, hence, exposed to a pedagogic influence that the other pupils in the same school did not get. The placement at the boarding homes was based on the distance to the nearest school and had no direct connection to pupils' skills.

We find a seven percent increase of GPA in the sixth grade for pupils that attended boarding homes for six years and more. For the boarding home pupils who stayed for a shorter time period we could not find any effects on the GPA in sixth grade. In a heterogeneity analysis, where we estimated effects from boarding home conditional on

the cognitive GPA in the first semester, we find larger effects for pupils with low cognitive skill initially. This supports the idea that there is a pedagogical effect from boarding homes that increases cognitive skill. We also found some weak evidence that pupils with low initial skills and many semesters at the boarding home also increased their educational attainment.

All in all, this paper supports the results found in Entwisle et al. (2007) about the importance of the family environment (presence of books, magazines and parents reading and tutoring) but also the claim that early interventions (see Heckman and Masterov 2007 for a survey) are important for equalizing skills in elementary schooling. However, at this time (in the 1950's) there were only very small effects (if any) on educational attainment and life time earnings.

How should this last result be interpreted? It is clear that boarding home individuals with six years or more have less advantageous family backgrounds than the non-boarded individuals. Despite this difference they obtained no less formal education and no less income than the non-boarded. Hence the increased pedagogical stimuli could equalize the differences in family background. Because of liquidity constraints, the individuals from lower social classes needed to have higher ability, on average, than students from higher social classes in order to motivate the choice into higher studies.³³

This interpretation of a liquidity constraint for higher education is supported by the fact that the boarding home individuals with six years or more at the boarding homes experienced higher educational attainment and higher income than their boarded peers (with similar family background) with less time at the boarding homes. Thus, it is highly likely that this effect stems from the increase in cognitive ability due to the more learning friendly environment at the boarding homes compared to the home environment.

There seems to be an agreement today, at least in the developed part of the world, that financial restrictions are less important than the socio-economic environment.³⁴

³³ We have information on income and wealth for the parents in 1968 for a subset of the pupils. When we control for these variables the results did not change. We do not emphasize this result since the sample size is reduced by about two thirds.

³⁴ Manski and Wise (1983) found that the "Pell"-stipendium has a positive effect on entry into higher education. However, Kane (1994) found no effect of the Pell-stipendium for children from low income families. Dynarski

However in the 1940's and 1950's income liquidity constraints seem to have been important for continuing into higher education.³⁵ During this time period the Swedish study grant system was very diverse and there was no general system financing higher education. There existed a variety of options and even though the different systems were expanded during the 1940's it must have been difficult for students from poor backgrounds to finance higher studies. In 1944 the government study grant amount to SEK 3 millions. In 1963 this amount had increased to SEK 145 millions (SOU 1963:74).³⁶ A general study grant was introduced in Sweden in 1965.

What can be learnt from this paper in terms of the current policy discussion? If the aim is to reduce social stratification in education there are two policy options: either (a) remove existing home work; or (b) offer qualified assistance, such as the assistance provided of the boarding homes, for pupils where they can do their homework.³⁷

(1999) found that the cut in the Social Security Pupil Benefit Program in the 1980s decreased entry into university and high schools. Dynarski (2000) and Corwell, Lee and Mustard (2006) estimated the effects of the Georgia's Help Outstanding Pupils Educationally (HOPE); the effects of the program were small, however. Penn and Kyle (2007) studied the effect of the Tennessee lottery scholarships and they found small positive effects on retention and enrollment. Chapman (2005) presents a review on the effects of the simultaneous introduction of pupil fees and income support on pupil admissions in Australia. The reform seems to have increased admittance, but the increase was larger for children from families with a better social background. Baumgartner and Steiner (2006) evaluated a German pupil aid reform in 2001 and found no effect on enrollment. See also Heckman and Masterov (2007) for discussion of the relative importance of family background and liquidity constraints.

³⁵ The result could potentially also be that financial restrictions are more important in Sweden than for other developed countries. Hammarström (1996) e.g. found that individual's choice of higher education in Sweden is restricted by family income. However, no relative comparison of the importance of liquidity constraints and family background is performed.

³⁶ In 2006 the total amount of grants and loans paid out to pupils in Sweden amounted to SEK 23.1 billions, source: www.csn.se.

³⁷ For a good example see <http://www.standards.dfes.gov.uk/studysupport/>. This is a study support, or out of school hours learning program run by the department for children, schools and families. The program covers activities which take place outside normal lessons and which have a learning focus.

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Appendix A

Grades are letter based and given on a seven point scale except for the subjects *Conduct* and *Order* where grades are given on a three point scale (grades in these subjects are A, B and C). The highest grade on the seven point scale is A which corresponds to having passed with great distinction. C is the lowest grade and corresponds to having failed. The grade scale in descending order is A, a, AB, Ba, B, Bc and C. Grades have been transformed to numeric values to be able to create grade point averages, GPA:s, for each individual. The highest grade, A, is given the numeric values 7. This continues for all grades until the grade C which is given the numeric value 1. Teachers could also reward pupils with either a plus or a minus for each subject grade. If an individual is given a grade with a plus the individual is rewarded 1/3 extra credit when calculating GPA:s. If there is a minus the individual loses 1/3 credit. In some cases there are missing values in single subjects and in these cases that subject is disregarded when the GPA is calculated. Besides the mean GPA, which is the mean of all subjects, three different indices of GPA:a are calculated based on different subsets of subjects. The first index (*GPACA*) is intended to measure cognitive abilities and consists of three theoretical subjects that children were taught during their complete elementary schooling period. These subjects are; (i) *Mathematics*, (ii) *Writing and language* and (iii) *Speech and reading exercises*. The second index (*GPASA*) is intended to measure social skills and consists of grades in (i) *Order* and (ii) *Conduct*. The final index (*GPAAO*) includes all the remaining subjects that pupils were taught. The highest possible GPA is seven while the lowest possible GPA is 1.

Appendix B

Table B 1. Number of pupils by school and share of boarding home individuals

School	Boarding home		Comparison		Total		Share of BH
	Obs.	Percent	Obs.	Percent	Obs.	Percent	Percent
Hedenäset	44	10.3	137	13.3	181	12.4	24.3
Karungi	25	5.8	158	15.4	183	12.6	13.7
Nattavaara	64	15.0	106	10.3	170	11.7	37.6
Pajala	49	11.5	233	22.6	282	19.4	17.4
Pålkem	66	15.4	40	3.9	106	7.3	62.2
Svanstein	59	13.8	81	7.9	140	9.6	42.1
Ullatti	63	14.7	207	20.1	270	18.5	23.3
Vojakkala	58	13.6	67	6.5	125	8.6	46.4
Total	428	100	1,029	100	1,457	100	29.4

Table B 2. Birth year distribution

Year	Boarding home		Comparison		Total	
	Obs.	Percent	Obs.	Percent	Obs.	Percent
1932	54	12.6	65	6.3	119	8.2
1933	51	11.9	85	8.3	136	9.3
1934	48	11.2	108	10.5	156	10.7
1935	35	8.2	79	7.7	114	7.8
1936	45	10.5	119	11.6	164	11.3
1937	42	9.8	113	11.0	155	10.6
1938	45	10.5	118	11.5	163	11.2
1939	42	9.8	116	11.3	158	10.8
1940	30	7.0	111	10.8	144	9.7
1941	36	8.4	115	11.2	151	10.4
Total	428	100	1,029	100	1,457	100

Table B 3. Educational attainment of parents in 1970

	Fathers				Mothers			
	Boarding home		Comparison		Boarding home		Comparison	
	Obs.	Percent	Obs.	Percent	Obs.	Percent	Obs.	Percent
Compulsory schooling < 9 years	35	100	108	83.1	107	100	257	86.8
Compulsory schooling 9 years	0	0	1	0.8	0	0	10	3.4
Upper secondary max 2 years	0	0	8	6.2	0	0	25	8.5
Upper secondary 3 years	0	0	8	6.2	0	0	2	0.7
Univ. <3 years	0	0	3	2.3	0	0	0	0
Univ. >3 years	0	0	2	1.5	0	0	2	0.7
Total	35	100	130	100	107	100	296	100

Table B 4. The effect of number of boarding home semesters on GPA (cognitive skill) in sixth grade

	(1)	(2)	(3)	(4)
BHs: boarded ≥ 1 semester but ≤ 2 years	-0.258 (0.250)	-0.166 (0.253)	-0.146 (0.269)	-0.391 (0.254)
BHm: boarded > 2 years but < 6 years	-0.148 (0.146)	-0.141 (0.158)	-0.047 (0.163)	-0.052 (0.164)
BHl: boarded ≥ 6 years	0.139 (0.113)	0.218 (0.132)	0.266* (0.139)	0.277** (0.136)
Female		0.423*** (0.079)	0.436*** (0.081)	0.246*** (0.076)
GPA – cognitive skill				0.803*** (0.099)
GPA – social skill				0.030 (0.038)
GPA – other				-0.189 (0.137)
Constant	3.903*** (0.046)	3.636*** (0.289)	3.119*** (0.528)	0.643 (1.032)
Controls for school and year	No	Yes	Yes	Yes
Controls for socio-economic status of parents	No	No	Yes	Yes
Observations	436	436	436	417
R^2	0.01	0.10	0.16	0.35

Note: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio economic status consist of five dummy variables for both fathers and mothers. Interaction terms between these variables are also included in the specifications.

Table B 5. The effect of number of boarding home semesters on GPA (social skill) in sixth grade

	(1)	(2)	(3)	(4)
BHs: boarded ≥ 1 semester but ≤ 2 years	-0.058 (0.194)	0.024 (0.174)	-0.004 (0.191)	-0.081 (0.255)
BHm: boarded > 2 years but < 6 years	-0.134 (0.165)	-0.176 (0.164)	-0.151 (0.190)	-0.051 (0.132)
BHl: boarded ≥ 6 years	0.001 (0.070)	0.115 (0.076)	0.111 (0.083)	0.086 (0.085)
Female = 1		0.314*** (0.061)	0.307*** (0.061)	0.287*** (0.061)
GPA – cognitive skill				0.014 (0.079)
GPA – social skill				0.060* (0.034)
GPA – other				-0.087 (0.136)
Constant	6.858*** (0.034)	6.545*** (0.428)	6.573*** (0.483)	5.975*** (0.817)
Controls for school and year	No	Yes	Yes	Yes
Controls for socio-economic status of parents	No	No	Yes	Yes
Observations	436	436	436	417
R^2	0.00	0.14	0.17	0.18

Note: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio economic status consist of five dummy variables for both fathers and mothers. Interaction terms between these variables are also included in the specifications.

Table B 6. The effect of number of boarding home semesters on GPA (other subjects) in sixth grade

	(1)	(2)	(3)	(4)
BHs: boarded ≥ 1 semester but ≤ 2 years	-0.201 (0.218)	-0.119 (0.227)	-0.087 (0.230)	-0.224 (0.253)
BHm: boarded > 2 years but < 6 years	-0.249*** (0.090)	-0.206** (0.090)	-0.164 (0.100)	-0.158 (0.114)
BHl: boarded ≥ 6 years	0.065 (0.076)	0.169* (0.086)	0.177* (0.091)	0.170* (0.090)
Female = 1		0.394*** (0.054)	0.397*** (0.055)	0.263*** (0.055)
GPA – cognitive skill				0.418*** (0.069)
GPA – social skill				0.021 (0.027)
GPA – other				0.052 (0.098)
Constant	4.072*** (0.033)	3.664*** (0.156)	2.961*** (0.301)	1.503*** (0.517)
Controls for school and year	No	Yes	Yes	Yes
Controls for socio-economic status of parents	No	No	Yes	Yes
Observations	436	436	436	417
R ²	0.02	0.17	0.22	0.36

Note: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The controls for socio-economic status consist of five dummy variables for both fathers and mothers. Interaction terms between these variables are also included in the specifications.

Table B 7. The effect of number of boarding home semesters on fathers and mothers income in 1968. The same specification as in Table B4

	Father's income	Mothers's
BHs: boarded ≥ 1 semester but ≤ 2 years	-1,084.721 (1,333.479)	-411.879 (1,130.896)
BHm: boarded > 2 years but < 6 years	361.706 (1,507.131)	-1,232.802* (696.533)
BHl: boarded ≥ 6 years	-339.959 (1,125.213)	-727.611 (601.550)
Female	-1,162.183 (890.392)	-804.689 (589.111)
GPA – cognitive skill	1,389.113 (1,208.837)	-230.203 (773.119)
GPA – social skill	-110.933 (614.873)	266.700 (278.210)
GPA – other	3,287.139 (2,177.889)	2,904.141** (1,342.161)
Constant	9,993.068** (4,825.494)	-1,925.782 (4,385.266)
Controls for school and year	Yes	Yes
Controls for socio-economic status of parents	Yes	Yes
Observations	783	665
R-squared	0.194	0.186

Note: Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

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