Age at School Entry and Intergenerational Educational Mobility

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Abstract

We use Swiss data to test whether intergenerational educational mobility is affected by the age at which children first enter (primary) school. Early age at school entry significantly affects mobility and reduces the relative advantage of children of better educated parents.

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Keywords: age at entry, intergenerational transmission of education, educational mobility.

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"… early intervention to equalize allocation may
be a more cost-effective way of promoting equity
than compensating for unequal outcomes."
J. Currie (2001, p.216)

1. Introduction

A high correlation between parent and child educational outcomes typically generates low intergenerational income mobility. While there is substantial scientific interest in comparing intergenerational mobility across societies we still know very little about its determinants.[1] Past research found institutional features such as a high age at school tracking to increase educational mobility (Bauer and Riphahn 2006, Hanushek and Wößmann 2006). Yet substantial mobility differences exist across institutional regimes with similar tracking ages. This study proposes the age at school entry as an additional determinant of educational mobility and measures its causal effect in the institutional framework of Switzerland.

Our research question differs from a literature which studies the effect of age at school entry on pupils' educational performance (e.g. Angrist and Krueger 1992, Currie 2001, Bedard and Dhuey 2006). These analyses do not consider the potential ramifications of the age at school entry for intergenerational education transmission. However, Currie (2001) points to the beneficial equity effect of an early start of general schooling which balances educational endowment differences across pupils more effectively than a system where public education starts later in a child's life. We test whether this equity advantage of early intervention is reflected in the extent of intergenerational educational mobility. – To our knowledge this is the first study to analyze the intergenerational mobility effect of the age at school entry.

We apply data on educational outcomes within a single country, i.e. Switzerland. This

[1] For a comparative study on income mobility see e.g. Solon 2002, for a comparison of education mobility see e.g. Chevalier et al. (2003) or Shavit and Blossfeld (1993).

avoids problems inherent in cross-national comparisons where more than one institutional feature differs across comparison groups and may determine the outcome of interest. We identify the causal effect of the age at school entry on educational mobility based on institutional differences across the Swiss federal cantons. The Swiss educational system is organized at the cantonal level. Probably for historical reasons the 26 cantons impose different regulations regarding age of school entry within otherwise comparable institutional frameworks.

2. Data and Empirical Approach

We apply cross-sectional data from the 2000 Swiss population census. The dependent variable indicates the type of secondary training a youth receives at age 17 in categories of high (college-bound), medium (advanced vocational), and low (only mandatory) levels of secondary schooling (for details see Bauer and Riphahn 2007). We similarly categorize parental education.[2] To measure the magnitude of intergenerational education transmission we evaluate the probability that children attend high level (i.e. college-bound) secondary schooling given their parents' education.

In our sample of 62,535 Swiss born youths we observe vast differences in the probability of attaining high level secondary education by parental educational background: among children of fathers with low education about ten percent attend high secondary education. Among the children of highly educated fathers this holds for more than sixty percent.

To investigate the role of the age at school entry we use information from a survey of cantonal education departments where we collected information on the typical age at school

[2] We consider five education indicators for each parent: high, middle, low, no information provided, parent missing (i.e. single parent household).

entry for the early 1990s. 18 of the 26 cantons clearly stated age 6 (11 cantons) or age 7 (7 cantons) as the regular age of school entry, the other 8 cantons provided age ranges.[3] In order to illustrate the validity of our identifying assumption we compare the average characteristics of cantons with early and late age of school entry in **Table 1**. Only few characteristics differ significantly for the two groups of cantons. While some indicators suggest higher overall educational attainment in cantons with early school enrolment, cantons with late school enrolment spend a higher share of the public budget on education. Overall, these figures do not cast doubt on our identification strategy.

Table 2 describes the probability of high child secondary schooling given fathers' education in cantons with early (age 6) and late (age 7) school enrolment. The table separately considers age at entry based on interval midpoints (MID), the earliest (EARLY) and the latest (LATE) school entry ages. A comparison across columns yields that the probability of high (i.e. college-bound) child education increases when fathers are of high, rather than low education (cf. columns 1 and 2). A comparison across rows yields that this difference in the probability of high education varies depending on the age at which children enter school. The differences in the absolute probabilities are mostly insignificant and suggest that early school entry reduces mobility (cf. column 4). We find a significant increase in the relative difference across parental education if the separation is taking place later, rather than earlier, across all three indicators (cf. column 5).

We test whether educational mobility responds to age at entry when controlling for composition effects. We estimate flexible multinomial logit models which regress youth educational outcome (Y) on parental education (PE) and control for a large number of

[3] In our baseline estimations we apply the given ages at school entry and use the midpoint (MID) where intervals were provided. In robustness tests we investigate whether our results are sensitive to the coding of the age at entry variable and distinguish results when using only the lower (EARLY) or upper (LATE) bound of the age at entry interval.

household, parental, regional, and individual characteristics (X), as well as for an indicator of the age at school entry (Entry).[4] The model is completed by interaction terms of parental education and the age of school entry (PE · Entry):

$$Y = a + b\,PE + c_0\,X + c_1\,Entry + d\,(PE \cdot Entry) + \epsilon, \quad (1)$$

$$\partial Y / \partial PE = b + d\,Entry \quad (2)$$

A jointly significant coefficient vector "d" suggests that the impact of parental education indeed varies depending on the age at school entry. In order to evaluate the age of entry effect we use the estimation results to predict the probability of college-bound (high) secondary schooling for children of parents with high and low education. A difference-in-differences type comparison of the probabilities in situations of early and late school entry then indicates the relevance of the age at entry for educational mobility.

3. Findings

The estimation results are not presented to save space (available from the authors upon request).[5] **Table 3** describes the probabilities which are predicted based on estimated coefficients (see columns 1-3). For robustness checks the estimations were performed separately for indicators of the midpoint of the age range of school entry (Panel A: MID), the earliest age of school entry (Panel B: EARLY), and the latest possible age of school entry (Panel C: LATE). In all three cases the eight coefficients "d" of the interaction terms (PE · Entry) (see equation 2) were jointly statistically significant at least at the five percent level.

[4] The empirical model controls for a total of 8 indicators of paternal and maternal education, a total of 20 indicators of paternal and maternal occupational position, age of father and age of mother, 4 indicators of religion, 4 indicators of the number of siblings, 6 region indicators, population density in the area of residence, sex of the child, indicator of late school entry and 8 interaction terms of late school entry and parental education.

[5] A Hausman test indicated that the IIA assumption of the multinomial logit estimator cannot be rejected in our data.

Thus the correlation between parent and child education appears to be significantly modified by the timing of tracking.

In column 4 (7) **Table 3** provides the absolute difference in the predicted probabilities of children with high and low (middle) educated fathers to attain the highest secondary school degree. Column 10 (13) provides the relative differences. The subsequent columns provide p-values for tests of the hypotheses that these probability differences differ across age of school entry regimes. In all cases the probability difference increases with higher age at school entry. The relative differences are more often statistically significant than the absolute differences. The evidence does not allow us to reject the hypothesis that early age at entry yields higher intergenerational mobility.

In Bauer and Riphahn (2006) we showed, that the age of tracking pupils in ability-based streams of secondary school significantly affects intergenerational mobility. As the tracking age constitutes another difference across Swiss federal cantons we need to determine whether the effect of age of school entry on intergenerational educational mobility is robust to controls for the age of tracking. In additional estimations we controlled for whether a canton follows an early or a late tracking regime and reevaluated the effect of the age at school entry. Our results are unchanged, early age at school entry has beneficial and robust effects on educational mobility even conditional on the age of tracking.

4. Conclusion

Based on a literature that investigates the educational attainment effects of age at school entry we hypothesize that early schooling contributes to reduce intergenerational educational transmission and to increase educational mobility. This positive effect of early entry is confirmed in our analysis which takes advantage of institutional differences across Swiss cantonal education systems. The approach is similar to a difference-in-difference

estimation and identifies the causal effect of age at entry if there are no unobservable mobility differences between cantons that are correlated with age at entry.

This is the first test of the effect of age at school entry on educational mobility. It is particularly reliable, as it operates within a given national institutional framework and thus is unaffected by other institutional differences that hamper studies which apply international comparisons to identify the effect of interest.

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Table 1 Mean characteristics of cantons with early and late age of school entry

	Mean in early school enrolment cantons	Mean in late school enrolment cantons	Test of equality of means (p-value)
Population share: tertiary degree	0.048	0.043	0.598
Population share: advanced school degree	0.095	0.086	0.584
Population share: no more than mandatory schooling	0.246	0.240	0.697
Advanced school graduations 2000 / 1000 inhabitants	2.338	1.923	0.071 +
University graduations 2000 (in 1000 inhabitants)	1.298	1.058	0.115
Education expenditures per capita (in Swiss Francs)	2602.8	2635.0	0.843
Share of education expenditures in public expenditures	0.271	0.288	0.366
Average teacher salary in primay schools	100.50	100.88	0.912
Average teacher salary in secondary schools	102.60	96.419	0.087 +
Performance based teacher pay (5=high, 1 = low)	2.154	3.385	0.016 *
Primary teacher probability of job change (in percent)	3.846	3.077	0.435
Secondary teacher probability of job change (in percent)	5.077	2.923	0.055 +

Source: Own calculations based on population census 2000 and Müller Kucera and Stauffer (2003). **, * and + indicate significantly different means at the 1, 5 and 10 percent level.

Table 2 Observed probability of child high secondary education by paternal education and cantonal age at school entry

	P(high | low) 1	P (high | high) 2	Abs. Diff. 3	p-value 4	Rel. Diff. 5	p-value 6
(A) MID						
enrolment: 6	0,155 (0,007)	0,689 (0,010)	0,534	0,068	4,44	0,000
enrolment: 7	0,067 (0,005)	0,575 (0,012)	0,508		8,53	
(B) EARLY						
enrolment: 6	0,130 (0,005)	0,652 (0,007)	0,522	0,177	5,03	0,000
enrolment: 7	0,067 (0,005)	0,575 (0,012)	0,508		8,53	
(C) LATE						
enrolment: 6	0,175 (0,007)	0,698 (0,009)	0,523	0,266	3,99	0,000
enrolment: 7	0,078 (0,004)	0,592 (0,008)	0,514		7,63	

Note: P (high | low) describes the probability that children of fathers with low education pursue the high secondary track, the other probabilities similarly condition on fathers' education. Standard errors are in parentheses, the p-values apply to one sided tests of the null hypotheses that the absolute and relative differences across school entry regimes are identical.

Table 3 Predicted probability of child high secondary education by parental education and cantonal enrolment regime

				Absolute Differences						Relative Differences					
	1 P(high | low)	2 P (high | mid)	3 P (high | high)	4 = 3 - 1	5 Diff. age 6-5 and 7-6 p-value	6 Diff. age 7-5 p-value	7 = 3 - 2	8 Diff. age 6-5 and 7-6 p-value	9 Diff. age 7-5 p-value	10 = 3 / 1	11 Diff. age 6-5 and 7-6 p-value	12 Diff. age 7-5 p-value	13 = 3 / 2	14 Diff. age 6-5 and 7-6 p-value	15 Diff. age 7-5 p-value
(A) MID															
enrolment: 5	0,202	0,359	0,646	0,443			0,287			3,193			1,801		
	(0,133)	(0,171)	(0,174)	(0,092)			(0,068)			(1,635)			(0,549)		
					0,169			0,047			0,062			0,052	
enrolment: 6	0,115	0,258	0,616	0,501		0,233	0,358		0,083	5,346		0,066	2,391		0,051
	(0,088)	(0,147)	(0,176)	(0,113)			(0,071)			(2,890)			(0,872)		
					0,333			0,138			0,071			0,052	
enrolment: 7	0,061	0,176	0,583	0,522			0,407			9,544			3,317		
	(0,052)	(0,118)	(0,180)	(0,141)			(0,091)			(5,461)			(1,388)		
(B) EARLY															
enrolment: 5	0,174	0,323	0,671	0,497			0,348			3,852			2,075		
	(0,125)	(0,169)	(0,170)	(0,095)			(0,071)			(2,256)			(0,779)		
					0,395			0,257			0,060			0,034	
enrolment: 6	0,105	0,241	0,618	0,513		0,487	0,377		0,328	5,895		0,061	2,561		0,030
	(0,084)	(0,146)	(0,179)	(0,119)			(0,075)			(3,383)			(0,999)		
					0,601			0,411			0,066			0,030	
enrolment: 7	0,060	0,174	0,560	0,500			0,387			9,339			3,225		
	(0,052)	(0,120)	(0,186)	(0,147)			(0,094)			(5,263)			(1,266)		
(C) LATE															
enrolment: 5	0,162	0,304	0,575	0,413			0,270			3,550			1,888		
	(0,087)	(0,147)	(0,179)	(0,126)			(0,087)			(4,675)			(1,245)		
					0,026			0,029			0,254			0,202	
enrolment: 6	0,112	0,248	0,591	0,479		0,001	0,342		0,000	5,283		0,024	2,378		0,012
	(0,088)	(0,148)	(0,182)	(0,118)			(0,074)			(2,819)			(0,843)		
					0,032			0,006			0,099			0,089	
enrolment: 7	0,075	0,199	0,607	0,532			0,408			8,116			3,049		
	(0,067)	(0,134)	(0,179)	(0,132)			(0,084)			(4,774)			(1,291)		

Note: P (high | low) describes the probability that children of fathers with low education pursue the high secondary track, the other probabilities similarly condition on fathers' education. In parentheses are bootstrapped standard errors, the p-values apply to one-sided tests of the null hypotheses that the absolute and relative differences (presented in columns 4, 7, 10 and 13) in the early enrolment regime are smaller than in the late enrolment regimes.
Source: Own calculations based on Census 2000 and on a survey of cantonal education departments.

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