Institutional Determinants of Intergenerational Education Transmission – Comparing Alternative Mechanisms for Natives and Immigrants

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Abstract

We use census data on 26 Swiss cantons to determine the association of educational institutions with the intergenerational transmission of education. We test whether education transmission is higher when children enter kindergarten and school earlier and when tracking occurs at a later age. In contrast to the literature we consider the three institutions jointly. Our evidence matches hypotheses when institutions are studied in separation. Educational mobility is positively associated with early kindergarten attendance, particularly for immigrants. Time of tracking loses statistical significance when kindergarten and school entry regimes are held constant. Our results are robust to various alternative specifications.

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Keywords: educational mobility, kindergarten, age of school entry, age of tracking, immigrants.

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1. Introduction

Typically, intergenerational transmission of education reflects inequality in access to education and, subsequently, to labor market opportunities (Black and Devereux 2011). While countries differ substantially in intergenerational education transmission (e.g., Hertz et al. 1997, OECD 2011), we know little about the reasons behind these differences. Intergenerational educational mobility appears to be determined by factors related to genetics (nature), to parental behavior (nurture), and to specific institutions of education systems. If patterns of genetic transmission and parental behavior are similar across countries international differences in educational mobility should be connected to institutional differences. We study the association of educational mobility with educational institutions. Our results contribute to explain the substantial cross-country heterogeneity in education mobility.

This paper takes advantage of the heterogeneity in the institutions of 26 Swiss cantons. For centuries, Swiss cantons have determined the specific institutional features of their education systems (Stadler 2011). Thus, we use the results of historic developments that much precede the outcomes studied here to investigate the association between institutions and intergenerational mobility. Based on inter-cantonal heterogeneity, we determine the contribution of age at (i) entry to kindergarten, (ii) entry to primary school, and (iii) secondary school tracking to the extent of intergenerational educational mobility, and investigate whether these patterns differ for natives and second generation immigrants.

Various mechanisms may be behind the association of educational institutions and intergenerational education mobility. Early entry to kindergarten or pre-school may improve subsequent educational outcomes particularly for youths from disadvantaged parental backgrounds for several reasons: early entry may stimulate cognitive capacities, transmit positive attitudes towards learning, improve self-esteem, and expose children to the language later spoken in school (Currie and Thomas 1999, Heckman 2006). Similarly, entering school

early may improve the learning environment particularly for children of less educated parents. If disadvantaged pupils receive additional support, the relevance of their parental background should diminish. Finally, tracking pupils in ability based school-types at a later age can affect educational mobility; at a later age of tracking more information on scholastic aptitude is available and reduces the probability of misallocating pupils. If children are tracked early parents interfere and teachers may take parental background as a signal of pupils' ability (van Elk et al. 2011, Brunello and Checchi 2007, Jürges and Schneider 2011).

This study contributes to the literature on several counts: first, while already prior analyses studied the contribution of institutional factors to intergenerational education transmission these analyses typically focus on single characteristics of the educational system and evaluate their relevance in separation. For example, Elder and Lubotsky (2009) evaluate the effect of Kindergarten enrolment age on educational attainment and conclude that higher age at Kindergarten entry reduces educational mobility; Currie (2001) looks at public preschool programs and argues that early schooling may equalize educational endowment differences; Hanushek and Woessmann (2006) study the impact of early school tracking and find that it reduces educational mobility. We go beyond these studies by evaluating the contribution of different institutional features jointly and in a comparative perspective.[1]

Second, since institutional frameworks may affect subgroups of the population differently we study the entire population as well as natives and second generation immigrants, separately. Third, we solve two methodological problems that plague the literature on the effects of age at kindergarten or primary school entry on educational attainment. The first problem is the endogeneity of individual age at entry. We take advantage of exogenous variation in entry age requirements across 26 Swiss cantons. The second problem consists of the empirical challenge to separate the effects of age and age at entry on

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[1] This extends our earlier work (Bauer and Riphahn 2006, 2009, 2010) on single educational institutions. Here, we consider possible interactions between institutions; we control for a wider set of cantonal characteristics to justify causal inference, and we evaluate the relative magnitude of the institutions' association with educational mobility.

educational attainment. We address this problem by investigating educational outcomes that are not age-specific: we use attendance of the most academically oriented track as our outcome of interest and study educational mobility as the correlation between parental education and child secondary school track enrollment.

Fourth and finally, we compare institutional features within a given country. This allows us to be confident that the measured correlations indeed reflect institutional differences. In contrast, in cross-national comparisons numerous institutions and culture in general differ between comparison groups and may affect the outcomes of interest.

Our results support the hypotheses regarding the correlation patterns of the three institutional features with educational mobility. These correlations are confirmed independent of whether the institutions are considered separately or jointly. Intergenerational educational mobility is higher when children enter kindergarten and school earlier and when tracking occurs at a later age. However, the time of tracking effects are no longer statistically significant when other institutional features are considered. For second generation immigrants, the age at enrollment in kindergarten is most closely associated with educational mobility. These results are of immediate policy relevance if equal opportunity is on the political agenda.

The next section describes the Swiss education system, reviews the relevant literature, and states our hypotheses. Section 3 describes the data and first correlation patterns before it outlines our empirical approach. Results and robustness tests are presented in sections 4 and 5 before a conclusion is drawn in section 6.

2.   Background: institutions, literature, and hypotheses

2.1   Institutional background

In Switzerland, the responsibility for the education system is divided between the national government, cantons, and municipalities. While the national government only

regulates the timing of the school year and general quality requirements, cantons administer the institutions of the educational system. Cantons can transfer competencies to the municipal level which typically is responsible for pre-school, primary, and lower secondary education.

Most children attend a public kindergarten for up to two years. They are usually enrolled at age 4 or 5; in rare cases they may start already at age 3 (Annen et al. 2010).[2] Entry to compulsory school education is governed at the cantonal level based on rules regarding the child's age at a given calendar date (Arnet 2000). Compulsory school lasts for 9 years, divided into a primary and lower secondary level (see **Figure 1** for a depiction of the Swiss educational system). Generally, children enter primary school between the ages of 5 and 7 and remain there between 4 and 6 years. Then, they are tracked into different types of secondary school which they complete after grade 9. Afterwards the majority takes up an apprenticeship lasting between 2 and 4 years. Alternatively, vocational or general schools offer training either for specific occupations or to prepare for other specialized schools. Individuals aiming at a university education attend advanced school for another 3 to 4 years after grade 9. After completing advanced school they can transfer to university.

Table 1 summarizes institutional features of 26 cantonal education systems relevant for the birth cohort of 1983 which we analyze below. We study the age of enrollment in kindergarten, in primary school, and the timing of tracking. Columns 1 and 2 of **Table 1** show the heterogeneity of kindergarten enrollment regimes: they present the share of 4-years-olds attending kindergarten as well as the average age of children in kindergarten between 1987 and 1989 by canton. While in some cantons no 4-years-olds are in kindergarten, in other cantons about 80 percent of all 4-years-olds are enrolled. Similarly, the average age of

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[2] In recent years, obligatory kindergarten attendance was discussed intensely in Switzerland. For the period of our data, i.e. the birth cohort of 1983, the vast majority of cantons offered public kindergarten on a voluntary basis, only. Wannack et al. (2006) show that even in 2006 there was no legal obligation to attend kindergarten in 18 out of 26 cantons. Even though we have no information on legal obligations to attend kindergarten in the 1980s we assume that it existed at best for a small minority of cantons and should not affect our estimates.

kindergarten children varies between 4.02 and 6.03. In column 3 of **Table 1** we use information from a survey of cantonal education departments on the average age at school entry for the early 1990s. Column 4 of **Table 1** presents administrative education statistics on the cantonal grade of tracking as of 1995 (EDK 1995). Within Switzerland, tracking grades vary between grades 5 and 9. Most cantons use grade 6 as the first year of tracked instruction.

2.2 Literature and hypotheses

Most of the empirical literature on educational mobility focuses on the causal effects of nature (genes) and nurture (parenting behavior). Important contributions are, e.g., Black et al. (2005) or Björklund et al. (2006) who use natural experiments or compare adopted and biological children to study the causal effects of parents on child education.[3] The literature on institutional features of the education system typically studies single institutions in separation. Next, we survey prior contributions on the correlation between educational mobility and age at kindergarten entry, school entry, and tracking. Then we discuss the literature comparing educational mobility across population groups.

A number of contributions look at the age at kindergarten entry and its effects on educational attainment and mobility. Datar (2006) finds significant positive causal effects of delayed kindergarten entry on test score trajectories. The positive effects are larger for at-risk than for low-risk children in the U.S.. Elder and Lubotsky (2009) show that it is not the advanced age that makes those children more successful in school who went through kindergarten late, but instead their accumulated pre-kindergarten experience. These authors show that a higher age at kindergarten entry increases socioeconomic differences and reduces educational mobility. Similarly, Deming and Dynarski (2008) suggest that postponing kindergarten and school entry increases inequality because unequal backgrounds predominate longer in a child's life. Currie (2001) surveys the evidence on preschool programs without

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[3] For additional contributions to this literature see studies cited by Black et al. (2011), or Holmlund et al. (2011).

attention to their timing. She concludes that preschool programs particularly benefit disadvantaged children and thus may contribute to balance differences in educational starting conditions prior to school entry. Based on this brief review we hypothesize that early enrollment in kindergarten enhances educational mobility and is of benefit to disadvantaged children (hypothesis H1).

A broad empirical literature studies the causal effect of age at school entry on educational attainment. The three contributions by Bedard and Dhuey (2006), Puhani and Weber (2007), and Fredriksson and Öckert (2005) using cross-country, German, and Swedish data, show that later school entry improves educational outcomes. Bedard and Dhuey (2006) show that the correlation of age at school entry and high parental socioeconomic status in the U.S. increases inequality in educational outcomes: those with high socioeconomic status start school later and reap the double advantage of their parental background and advanced relative age. Puhani and Weber (2007) identify the causal effect of age at school entry in Germany based on the month of birth. Fredriksson and Öckert (2005) provide a similar analysis for Sweden. Both papers suggest that absolute age rather than being older than one's peers drives the positive age effect on attainment. So far, the literature has not discussed the effect of age at school entry on educational mobility. As entering school early may reduce the variation in learning-relevant preschool experience, our second hypothesis (H2) is that early enrollment at primary school enhances educational mobility and supports the disadvantaged.

Woessmann (2009) and Betts (2011) survey the literature on the effects of tracking on level and equity of educational attainment. Betts (2011) points out that tracking can take on various formats from within school tracking in the U.S. to between school tracking in European countries. He summarizes the evidence showing that early tracking exacerbates achievement differences correlated with family background. For example, Hanushek and Woessmann (2006) compare the inequality in pupils' attainment for educational systems with and without early tracking. They conclude that early tracking increases the inequality in

student performance without positive attainment effects. Brunello and Checchi (2007) also provide cross-country evidence showing that early tracking is detrimental to equality of opportunity in educational attainment. Schuetz et al. (2008) study the connection between early tracking and parental background effects (i.e. the number of books in students' homes) on student performance. They find that the relevance of parental background for child attainment increases if pupils are tracked early. This is confirmed by Woessmann et al. (2009), who use test score data on math and science competencies of 15-years-olds: the correlation of competence with parental background is larger in early tracking regimes. Taking advantage of state-level differences in tracking in Germany, Woessmann (2010) performs a similar analysis. He finds that attainment depends less on parental background in states that track later and have fewer tracks. Based on this evidence our third hypothesis (H3) is that late tracking enhances educational mobility.

The literature discussed so far studies the average correlation between institutions of the educational system and educational attainment and mobility. Another set of contributions addresses whether a given institutional framework affects natives and immigrants in the same way. Gang and Zimmermann (2000) compare intergenerational correlation patterns in educational attainment for natives and second generation immigrants in Germany and find that these patterns differ substantially. They confirm intergenerational correlation in education only for natives. Nielsen et al. (2003), Bauer and Riphahn (2007), and Aydemir et al. (2008) obtain similar evidence for Denmark, Switzerland, and Canada, respectively, where the association of educational attainment between parents and their children is much stronger among natives than among second generation immigrants. The authors hardly discuss rationales to explain this heterogeneity in educational mobility.[4] Aydemir et al. (2008) point out for Canada that immigrant educational mobility declines once third generation immigrants

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[4] Using PISA 20006 results, Song (2011) shows that parental background is an important determinant of the achievement gap between natives and Turkish second generation immigrants in Switzerland. Cobb-Clark et al. (2012) study the impact of institutional features on immigrant educational attainment.

are considered. Bauer and Riphahn (2007) investigate to what extent observable characteristics can explain the intergenerational transmission patterns for native and immigrant subsamples. Their rich specification accounts for about one third of the unconditional intergenerational education correlation, with slightly different patterns for natives and immigrants. However, they neglect institutional heterogeneities, which we address here. We hypothesize (H4) that institutions affect natives and immigrants differently, where native educational mobility may be more closely related to educational institutions than immigrants'. The next section describes the data and approach to test our four hypotheses.

3.   Data and empirical approach

3.1   Data

Our analysis requires individual and cantonal data. For individual information we use the Swiss census of 2000 which covers the entire population of Switzerland. In order to measure intergenerational correlation in educational attainment we code educational outcomes for Swiss born youths and their parents. We focus on the group of 17-years-olds, i.e. the birth cohort of 1983. At age 17, track choice is completed and provides an indicator of educational attainment. In addition, the 17-years-olds are most likely to still live in the parental household; this is important because the census data allow us to connect parent and child observations only if they reside in the same household. After dropping observations with missing information on parental characteristics and on regional identifiers our sample consists of 61,676 observations, which represents 89 percent of the population of Swiss-born 17-years-olds.[5] We consider individuals as natives if they have no parent who was born abroad (N=47,250). Those Swiss-born 17-years-olds with at least one parent who was born abroad

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[5] Out of 70,598 Swiss born youths, we cannot match parental information in 7,781 cases, typically because the youth indicated not to be the child of the household head. In 282 cases information on the type of school attended is missing and in 859 cases municipal identification cannot be provided. Overall the distribution of educational attainment among youths and their parents in our sample matches aggregate statistics.

are in our sample of second generation immigrants (N=14,426).

The dependent variable describes the educational choice of 17-years-olds. We categorize low, middle, and high education paths. Those who did not complete mandatory school or who are not pursuing continued education are coded in the low education group. Those who completed mandatory school and continue with vocational training or any school other than advanced school are coded in the middle group and those in advanced secondary school (cf. **Figure 1**) or already pursuing university education at age 17 are in the high education group.

Similarly, parental education is coded using four possible outcomes: high, middle, low educational degrees, and information missing. In our baseline estimations we consider the highest of paternal or maternal education as parental outcome. **Table 2** describes the distribution of educational outcomes and intergenerational correlations for our sample. Overall, we observe 10, 65, and 25 percent of youths in low, middle, and high education, respectively. More than 68 percent of natives attend middle education. In contrast, second generation immigrants are more likely to attend the low and high education tracks with only 55 percent in middle education. Youth educational choice is highly correlated with parental education: the probability to attend high education among children of low educated parents is one sixth of the same probability measure for children of highly educated parents. This relative disadvantage is larger among natives (about one tenth) than among immigrants (about one fifth), which confirms the internationally observed pattern of higher mobility among immigrants discussed before.

In our estimations we consider a set of individual and household level control variables gathered from census data. Besides highest parental educational degree we control for parental age, child sex and religion, and the number of siblings. **Table 3** shows summary statistics.

Table 1 already presented indicators of cantonal education regimes. The indicators

describe educational institutions that were in place when the 1983 birth cohort attended kindergarten and secondary school. In addition to these institutional features we consider a set of cantonal indicators to control for additional and otherwise unobserved heterogeneity at the regional level. We measure, e.g., cantonal education expenditures, the number of advanced schools per 1,000 residents at the municipal level, the availability of teachers, average class size in primary and secondary schools, the average educational attainment of the cantonal population, the language spoken in the region, and the population density in the municipality.[6] The bottom half of **Table 3** provides descriptive statistics.

3.2 Model and empirical approach

We are interested in intergenerational educational mobility and its heterogeneity across institutional regimes for both natives and immigrants. **Table 2** showed the unconditional intergenerational correlation patterns of education outcomes. In order to measure the association of educational mobility with institutional features and to test whether this association is robust to controls for composition effects at the household and regional level we estimate multivariate regression models.

The dependent variable describes the educational track attended (Y) by a 17-years-old. Its correlation with parental education (PE) yields the extent of intergenerational education transmission. In addition to parental education we control for individual, household, and regional characteristics (X) as well as for institutional indicators (*Inst*). These institutional indicators describe the educational regime that the individual experienced when attending kindergarten and school. We assign the institutional features of the canton where the individual is observed to live in 2000 assuming that the person has not moved.[7] We

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[6] In addition, we control for cantonal female labor force participation, the share of left wing parties in cantonal parliaments, cantonal income inequality, population size, the share of residents living in cities, and the extent of municipal autonomy in a canton.

[7] The census data inform about whether an individual changed the canton of residence in the preceding five years. 98 percent of the observations in our sample indicate that five

characterize cantonal institutions using the age at kindergarten and school entry and the time of tracking and add interaction terms of parental education and these three institutional indicators (*PE · Inst*) to the model. The estimated coefficients (d) show whether institutional regimes are correlated with intergenerational mobility. We use a multinomial logit model to estimate the parameters a-d of our empirical model (see equation 1). e represents an extreme value distributed error:

$$Y = a + b\ PE + c_0\ X + c_1\ Inst + d\ (PE \cdot Inst) + e, \tag{1}$$

$$\partial Y / \partial PE = b + d\ Inst \tag{2}$$

Equation (2) describes the intuition of the estimated intergenerational educational mobility including the potentially modifying effects of institutional regimes (the true marginal effect in the non-linear model is slightly more involved). If the coefficient vector 'd' is statistically significant educational mobility varies with institutional background.[8] Without further assumptions, the marginal effect in equation (2) can be interpreted as an intergenerational education correlation. The coefficient vector 'd' can only be interpreted as the causal effect of institutional regimes on educational mobility if the regional institutional regime *(Inst)* is exogenous in equation (1). This requires both, that families do not sort into cantons based on educational institutions and that regional institutional heterogeneity is uncorrelated with the characteristics of resident families or educational demands of the population.

The potential endogeneity of the regional institutional regime can be interpreted as an omitted variables problem: the observed institutions could be correlated with the error term due to a lack of controls for those cantonal characteristics that both, cause families to sort

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years ago they lived in the same canton. Based on the small sample share affected by mobility the effect of any measurement error related to changing the canton of residence should be minor. In addition, we tested whether the propensity to move between cantons within the last five years is correlated with intergenerational mobility and did not find significant patterns.

[8] An alternative procedure to relate intergenerational mobility to cantonal characteristics could follow the methods applied in Card and Krueger (1992a, 1992b). They relate returns to education and differences in returns to education to state level characteristics. We do not apply this procedure because we have far fewer cross-sectional units available and no panel dimension in our data.

across cantons and generate the observed policy responses. We address this omitted variables problem using a wide range of proxy explanatory variables (see bottom panel of **Table 3**): these cantonal measures of, e.g., education expenditures, class size, population educational attainment, and female labor force participation may be correlated with the unobserved mechanisms that we would like to control for. To the extent that our proxy measures control for the relevant unobserved underlying mechanisms we address the endogeneity problem that plagues all studies identifying institutional effects based on comparisons within countries.

Hanushek and Woessmann (2006) or Betts (2011) critically discuss this type of approach. However, Betts (2011, p.347) concedes: "On the other hand, across-country studies may suffer from greater omitted variable bias than studies using variation within a country, because of greater unobserved heterogeneity across countries than across areas within a country." Similarly, Woessmann (2010, p.235) stresses the advantages of using country-specific data, because with cross-country evidence "one can never be fully sure whether the observed features are exogenous to other country characteristics (…)." As the Swiss educational system is based on two centuries of cantonal government (Stadler 2011) it is unlikely that recent shifts in cantonal institutional details of the education system are connected to the outcomes of interest here.[9] Institutional features were introduced prior to the educational choices observed in our data (for similar reasoning see Hanushek and Woessmann 2006).[10]

Our analysis proceeds in three steps. In step one we estimate separate models for each of the three institutional indicators. This yields results that are comparable to the literature

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[9] The last intercantonal agreement on education dates back to 1970 (*Konkordat über die Schulkoordinaton*, Oct 28 1970). This may be indicative of the slow pace by which Swiss educational institutions change over time. It supports the point that the regulatory features in the late 1980s are not endogenous to the economic situation of the time in the separate cantons. Instead, the features are rather constant through time.

[10] For other studies that take advantage of cantonal heterogeneity for identification see, e.g., Funk and Gathmann (2011), Schaltegger and Feld (2009), Schaltegger and Kuttel (2002), or Feld and Kirchgässner (2001).

studying single institutional features.[11] In step two we consider the three institutional features jointly. This allows for possible interactions of cantonal institutions and yields comparable indicators of their correlation with educational mobility. In step three of our analysis we repeat step two and distinguish between native and immigrant samples. We conclude the analyses with a set of robustness tests.

4.   Baseline estimation results and predicted patterns

4.1   Separate institutions for the entire population

In step one of our empirical analysis we determine the association of intergenerational education mobility with institutional features in separate estimations, i.e., disregarding potential correlation patterns between the institutions. Our empirical models of youth educational attainment control for parental education, cantonal institutions (i.e., share of 4-years-olds attending kindergarten, age at school enrollment, or grade at tracking), the interaction of parental education and institutions, and a vector of control variables (X). We do not present the estimation results to save space (available upon request). In all three estimations the coefficients of the interaction terms between parental education and educational institutions were jointly statistically significant. This confirms that each of the three institutions modifies educational mobility, when considered separately. Also, the controls for cantonal characteristics are jointly highly statistically significant in all three estimations, confirming the relevance of cantonal heterogeneity.[12]

In order to determine and interpret magnitude, direction, and statistical significance of the institutional association with educational mobility we predicted the probability that a pupil attends higher education at age 17 by parental educational background and for different

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[11] These separate results repeat institution-specific analyses as presented in Bauer and Riphahn (2006, 2009, and 2010). However, here we apply a given specification for all three institutions and consider a much wider set of proxy variables to account for unobserved cantonal heterogeneity than in previous contributions.

[12] As we are using cross-sectional data and institutional indicators that do not vary over time it is not possible to consider canton fixed effects.

institutional features. The results, including bootstrapped standard errors of the predicted probabilities and their differences, are summarized in the three panels of **Table 4**. Columns 1-3 present the predicted probability of attending advanced education at age 17 with low, middle, and high parental educational background.[13] In Panel A we set the possible kindergarten entry regime to three possible outcomes: late entry to kindergarten, i.e., no children in kindergarten at age 4 (line 1), average age at entry to kindergarten (line 2), and early entry, i.e., a high share of 4-years-olds in kindergarten (line 3). Next, we calculate the difference in the predicted probabilities of attending higher education (shown in columns 1-3) for each of the three kindergarten scenarios. Columns 4 and 7 present these absolute and columns 10 and 13 the relative differences, which measure the relevance of parental background and thus indicate the extent of educational immobility in a given kindergarten entry regime. The differences are highly statistically significant. In the subsequent columns we investigate the heterogeneity of parental education effects across institutional regimes. The entries in columns 6, 9, 12, and 15 in Panel A compare intergenerational mobility in scenarios of late (line 1) and early (line 3) kindergarten enrollment; column 6, e.g., presents the difference between the educational immobility indicators shown in lines 1 and 3 of column 4.[14] All values are negative and indicate a higher intergenerational education correlation in a scenario of late (line 1) than early (line 3) kindergarten entry, which agrees with our first hypothesis (H1). Three of the four indicators are statistically significant.

In Panels B and C we investigate the association of age at school enrollment and time of tracking with educational mobility. Applying the same prediction procedures as in Panel A we find that the role of parental background is significantly lower in regimes of early school

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[13] The predicted values represent the average of individually predicted probabilities of child advanced school track choice after setting the parental education variables to the respective column-specific values for the full sample. In principle, one may study educational mobility based on the conditional probability of middle school attainment, as well. However, as the relevance of parental background for middle school attainment appears to be limited already at a descriptive level (cf. **Table 2**) we omit this additional perspective.

[14] The values in columns 5, 8, 11, and 14 describe the difference in educational mobility in a scenario of early or late vs. an average kindergarten entry age.

enrollment and late tracking: in Panel B, the difference in the probability of attending advanced school by parental background is larger in a scenario of late than early school enrollment. The entries in columns 6, 9, 12, and 15 indicate that these differences are significantly different from zero. Similarly, in Panel C the difference in the probability of attending advanced school by parental background is larger in a scenario of early than late tracking, with statistically significant absolute differences in columns 6 and 9.

Overall, the evidence does not reject our hypotheses (H1-H3) when we consider the three institutional features in isolation. A comparison of the magnitude of the institutional correlation patterns suggests that grade of tracking yields the largest absolute changes in intergenerational mobility, and that relative changes are largest in response to differences in the age of school entry.

4.2 Joint consideration of the three institutions

As step two of our analysis we consider the three institutions jointly in our vector of institutional indicators (*Inst*). This more general estimation framework allows for institutional interaction and correlation patterns. Also, the contribution of each of the three institutional features can be evaluated ceteris paribus. Appendix **Table A.1** presents the estimation results for the full sample in its first two columns (Model 1). We use these results to test the joint statistical significance of the institution-specific elements of the coefficient vector 'd' (see bottom rows of **Table A.1**). For the full sample, we find that the coefficients of the interaction terms of parental education with the share of 4-years-olds in Kindergarten are statistically significant at the one percent level. In contrast, age at first school enrollment does not modify the correlation of child and parent education in a statistically significant way. Grade of tracking would be significant only at the 11 percent level. This differs from the results of the

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analysis in step 1, where each of the three institutions significantly modified educational mobility, when considered separately.[15]

To interpret the estimation results we repeat the prediction procedure of **Table 4**, however, now based on the joint estimation of the three institutions. Again, we generated the predicted probabilities of attending advanced school conditioning on alternative values for parental education and for the considered institution. As before, all other explanatory variables are left unchanged. **Table 5** shows the results**.** Panel A describes the association between age at kindergarten enrollment and educational mobility. The results are very similar to those presented in **Table 4**. The joint estimation confirms that educational mobility is higher in a scenario of early than late enrollment in kindergarten. The differences in predicted probabilities are mostly statistically significant.

The results in Panel B of **Table 5** describe the association between age at school enrollment and educational mobility. The signs of the absolute and relative differences in predicted probabilities match those of **Table 4** and confirm that educational mobility is higher in regimes with early school entry. However, only the predicted relative differences are statistically significant. The correlation of early school enrollment with educational mobility is now substantially smaller and less precisely measured than in the separate estimations of **Table 4**.

Finally, we investigate the relative role of the time of tracking in Panel C. Here, the correlation with educational mobility lost precision when estimated jointly with the other indicators. While the pattern of higher mobility in cantons with late tracking is confirmed with respect to absolute differences, the effects are insignificant and even change sign when we inspect the relative differences.[16]

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[15] In the estimations presented in **Table A.1** the coefficients of the vector of cantonal control variables are again jointly highly statistically significant.

[16] One might suspect that the loss of precision of the parameter estimates in **Table A.1** and of the predicted probability differences in **Table 5** is associated with the correlation of the three institutional features. However, based on the 26 cantonal observations we obtain a

Overall, our "horse-race" analysis of the three institutional features yields that the correlation between mobility and age at entry to kindergarten is estimated most precisely. With respect to the magnitude of absolute mobility effects the grade of tracking variable yields the largest mobility differences, however, they are not estimated precisely. Thus, a significant association of the tracking regime and age at school entry with educational mobility can no longer be confirmed once the other institutions are controlled for. This also suggests that the prior literature might have generated different estimates of the causal effect of, e.g., early tracking if additional educational institutions had been accounted for in the estimations. Next, we study whether our results hold equally for the native and immigrant subsamples.

4.3 Joint consideration of the three institutions for native and immigrant subsamples

We saw in **Table 2** that educational outcomes and intergenerational correlation patterns differ for natives and second generation immigrants in Switzerland. Therefore, we test whether the relevance of institutions for both groups' intergenerational education transmission differs, as well. We apply two methods to compare the two subsamples. First, we interact the full set of policy indicators in our multinomial logit model with an indicator for second generation immigrants and generate predictions based on a regression of the full sample. Then we estimate the model as specified before, i.e. without immigrant interaction effects, separately for the native and immigrant subsamples.

The estimation results when using the interaction terms are presented in Appendix **Table A.1** (see Model 2). The complete set of interaction terms is jointly statistically significant at the 1 percent level suggesting that the correlation between educational

correlation coefficient of -.42 for the correlation between the share of 4-years-olds in kindergarten and age at school entry, similarly of .45 for the correlation between the share of 4-years-olds in kindergarten and time of tracking, and of -.18 for the correlation between age at school entry and time of tracking. Therefore, the lack of statistical significance does not seem to be driven by multicollinearity.

institutions and intergenerational mobility differs significantly for the two subsamples. The tests of joint significance of the institution-specific interaction terms with parental education (see the bottom of **Table A.1**) also show different patterns for natives and immigrants.

The predicted correlation of mobility with the institutional frameworks is presented for natives in **Table 6** and for immigrants in **Table 7**. Some institution-specific differences in predicted probabilities are now estimated imprecisely after adding the immigrant-specific interaction terms to the model. However, the overall patterns of **Table 5** are confirmed: we find evidence for significant mobility differences with respect to the age of entering kindergarten and school for both, natives and immigrants. While the predictions based on the grade of tracking are again insignificant, they continue to yield the largest absolute effect on the intergenerational mobility for both subsamples.

The predicted mobility effects based on separate estimations for the native and immigrant subsamples are presented in appendix **Tables A.2** and **A.3** (estimation results are not shown to save space). Even though the empirical approach applied here is substantially more flexible, the overall results are similar to those in **Tables 6** and **7**: most effects are in the expected direction. Statistically significant effects on intergenerational mobility obtain only for the first two institutions, the share of 4-years-olds in kindergarten and the age of school entry. Among immigrants, age of entry to kindergarten yields large and significant correlation patterns. At the same time, the largest absolute effect for natives derives from the grade of tracking.

We can summarize our evidence as follows: in all estimations and in all predictions early entry to kindergarten is correlated with higher intergenerational educational mobility. The effect is particularly large and precisely estimated for immigrants (see **Table A.3**). Similarly, young age at school entry is correlated with higher intergenerational mobility. However, this correlation is not always statistically significant and in a number of cases turns out the other way, i.e., with a negative sign of the total effect (see Panel B in **Tables 7** or

A.3). Once we control for the other institutions, the substantial mobility enhancing effect of late tracking, which is well established in the literature and which we confirmed in **Table 4**, loses precision. While it is statistically insignificant, the economic magnitude of the predicted effect is still substantial, particularly for the native subsample. In sum, immigrants' educational mobility responds most reliably to scenarios of early kindergarten entry. This is plausible if early kindergarten enrollment contributes to balance specific disadvantages of immigrants such as language ability which are less relevant for natives (Currie and Thomas 1999, Magnuson et al. 2006). Among natives, later tracking may be effective, but early entry to kindergarten and school are most reliably connected to higher mobility.

5.   Robustness tests

We tested a number of alternative specifications to investigate the robustness of our results: we (i) modify the indicators of the institutional framework, (ii) replace the measure of highest parental education by paternal or maternal educational attainment, (iii) study the heterogeneity between the main Swiss language regions, and (iv) omit observations of those youths from the sample who had moved between cantons in the years prior to the survey.

Because we already discussed the robustness of school enrollment and tracking outcomes elsewhere (see Bauer and Riphahn 2006, 2009) we focus here on kindergarten enrollment, which appears to be most reliably correlated with educational mobility across our specifications. So far, we have considered the cantonal share of 4-years-olds in kindergarten as our indicator. Alternatively, we can use the average age of children in kindergarten by canton. We prefer the share of 4-years-olds because - in contrast to the average age of children in kindergarten - it is independent of the regulation of age at school entry. In appendix **Table A.4** we present the predicted mobility patterns when the average age of kindergarten children is used instead of the share of 4-years-olds for the full sample (cf. **Table 5**). All predictions in Panel A confirm the mobility increase when average age in kindergarten

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is low instead of high, however, most outcomes are imprecisely determined. The results on the other two institutions are not affected by changing the indicator used in Panel A. Interestingly, when we apply average kindergarten age instead of the share of 4-years-olds, this institution yields the largest of the three institutional effects. Thus, while the effects are not all statistically significant they continue to be economically significant.

Next, **Table A.5** presents the results when using maternal education instead of highest parental education. Again, the predicted effects of the kindergarten entry regime are larger and more significant than those of the other two institutions. When we use paternal instead of maternal or parental education the results for the full sample are very similar (not presented to save space).

There is substantial cultural heterogeneity between the German and the romanic, i.e. French and Italian, language regions of Switzerland (see, e.g., Brugger et al. 2009 for a discussion). In order to evaluate whether cultural differences affect mobility beyond our vast set of control variables we reestimated our model and interacted the vector of institutional variables with an indicator for the romanic language region.[17] The interaction terms were jointly statistically significant at the 1 percent level. Appendix **Tables A.6** and **A.7** show the predictions which we generated separately for the two language regions. The predictions are rather similar. For both regions we confirm higher mobility with early kindergarten and school entry and late tracking. The correlation between time of tracking and mobility appears to be somewhat stronger in the German language region, while the school entry effect is larger in the romanic regions.

Finally, we address the concern that non-random mobility affects our estimates. We repeated our analysis after dropping observations which changed their canton of residence in the last 5 years (now using 60.264 instead of 61.676 observations). The results hardly changed compared to **Table 5** (results not presented to save space).

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[17] This includes the cantons Neuchatel, Vaud, Geneva, Jura, Fribourg, Valais, and Ticino.

6.   Conclusion

We observe substantial heterogeneity in the extent of intergenerational education transmission across countries. Most of the literature on educational mobility is concerned with the measurement of causal effects of parental genes and behavior (nature vs. nurture) on education transmission (for a recent survey see, e.g., Holmlund et al. 2011). However, factors related to nature and nurture can hardly be central to the explanation of cross-national differences in educational mobility. Therefore and to improve our understanding of the key drivers of educational immobility we study the relevance of educational institutions for intergenerational educational mobility.

This article takes advantage of institutional heterogeneity between Swiss cantons and a large administrative dataset to determine the association of intergenerational education mobility with three features of the education system: age at kindergarten entry, age at primary school enrollment, and the time of educational tracking. In order to justify a causal interpretation of the estimated correlation patterns our estimations condition on a rich vector of proxy variables which account for unobservable determinants of educational attainment at the cantonal level. Since the effect of educational institutions on educational outcomes may differ across population groups we separately investigate the heterogeneity of the effects for natives and second generation immigrants.

We find that early kindergarten enrollment, early primary school enrollment, and late tracking are correlated with - or even cause - higher intergenerational education mobility. Prior studies typically looked at these three institutions in separation. Our approach allows us to go beyond institution-specific analyses, to determine the robustness of the findings for individual institutions, and to evaluate the relative impact of each of the three institutions. We find that the results differ depending on whether institutions are considered individually or jointly.

When estimated in separation, we find the expected significant correlation pattern between each of the institutions and intergenerational mobility. However, once all three institutions are controlled for, time of tracking loses statistical significance, whereas the correlation of the age at kindergarten enrollment with educational mobility can be determined precisely. Particularly among second generation immigrants the age of kindergarten and school enrollment are important for educational mobility. This apparent interdependence of institutions within an education system has not been discussed before and is of importance for research that focuses on single institutions: while institutions appear to affect educational mobility when considered separately, they may turn out to be substantially less relevant once additional features of the education system are added to the analysis.

Our results are robust to a rather broad set of control variables that account for cantonal heterogeneities, to the use of different measures of institutional characteristics, to the change of parental education indicators, and to alternative estimation approaches. They hold up for natives and second generation immigrants as well as for culturally heterogeneous groups of the Swiss population, i.e. the German and romanic language regions. The findings suggest that if policy makers wish to enhance educational mobility through adjustments in the institutional framework, allowing for earlier kindergarten enrollment might be the way to go, in particular with respect to immigrants. The international heterogeneity in pre-school institutional arrangements may contribute to explain cross-national differences in intergenerational educational mobility.
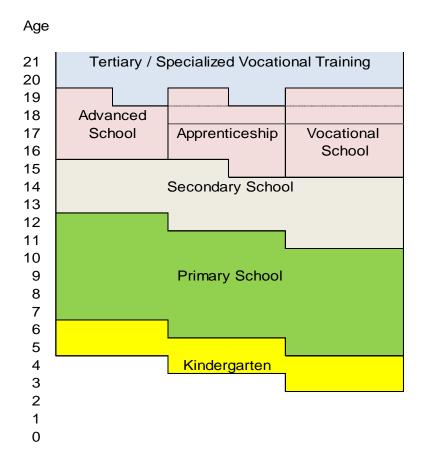
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Figure 1   Sketch of the Swiss educational system

Age

Source: Simplified description of general structures. The patterns in some of the 26 cantons differ from what is depicted.

Table 1   Institutional regulation by canton

Canton	Share of 4 year olds in kindergarten (1)	Average age in kindergarten (2)	Average age at school enrollment (3)	Completed grade at tracking (4)	Number of obser-vations (5)
1 Zuerich	0.12	5.37	6.50	6.00	9291
2 Bern	0.02	5.70	7.00	6.00	8668
3 Luzern	0.01	5.81	6.25	6.00	3340
4 Uri	0.01	5.90	7.00	6.00	388
5 Schwyz	0.00	5.88	6.00	6.00	1315
6 Obwalden	0.00	6.03	6.00	6.00	331
7 Nidwalden	0.00	5.92	6.80	6.00	384
8 Glarus	0.13	5.36	6.00	6.00	446
9 Zug	0.01	5.68	6.00	6.00	800
10 Fribourg	0.01	5.59	6.50	6.00	1944
11 Solothurn	0.05	5.53	6.50	5.00	2352
12 Basel-Stadt	0.20	5.24	7.00	7.00	1023
13 Basel-Landschaft	0.11	5.37	6.50	5.00	2270
14 Schaffhausen	0.19	5.31	6.75	6.00	679
15 Appenzell AR	0.00	5.57	6.00	6.00	570
16 Appenzell IR	0.04	5.67	7.00	6.00	199
17 St. Gallen	0.04	5.57	6.00	6.00	4548
18 Graubünden	0.07	5.49	7.00	6.00	1810
19 Aargau	0.04	5.50	7.00	5.00	5347
20 Thurgau	0.02	5.66	7.00	6.00	2407
21 Ticino	0.78	4.23	5.84	9.00	1947
22 Vaud	0.44	4.88	6.00	5.00	4658
23 Wallis	0.42	5.02	6.00	6.00	2554
24 Neuenburg	0.10	5.18	6.00	6.00	1292
25 Genf	0.82	4.02	6.00	6.00	2399
26 Jura	0.33	5.11	6.00	6.00	714
Minimum	0.00	4.02	5.84	5.00	199
Maximum	0.82	6.03	7.00	9.00	9291
Mean	0.15	5.41	6.41	6.00	2372
Std. Dev.	0.23	0.47	0.44	0.75	2399

Source: Columns 1 and 2: Information on cantonal kindergarten regimes in the period 1987-1989, is provided by the Swiss Statistical Office, Section School and Vocational Education. Column 3: survey of cantonal education departments on typical age at school entry for the early 1990s. Column 4: administrative education statistics on the grade of tracking in 1995 (EDK 1995). Column 5: number of observations in our sample by canton.

Table 2   Distribution of the dependent variable by subsample

Youth education	All	Parental education			Natives	Parental education			Immigrants	Parental education		
		Low	Medium	High		Low	Med.	High		Low	Med.	High
Low	10.0	19.2	8.2	8.1	8.7	17.4	7.5	6.8	14.6	21.2	11.8	10.4
Medium	65.2	71.6	71.0	32.0	68.1	76.5	72.6	34.0	55.4	65.9	62.7	28.7
High	24.8	9.2	20.8	59.9	23.2	6.1	19.9	59.2	30.0	12.9	25.6	60.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: In some cases parental education information is missing. While these cases are considered in the analyses, they are not presented here for brevity. The table uses 61,676 observations in total, 47,250 on natives and 14,426 on second generation immigrants.
Source: Census 2000, own calculations.

Table 3   Descriptive statistics

	All		Natives		Immigrants	
	Mean	SD	Mean	SD	Mean	SD
Individual indicators						
Highest parental education: Low	0.134	0.341	0.095	0.293	0.263	0.440
Highest parental education: Middle	0.702	0.457	0.772	0.419	0.472	0.499
Highest parental education: High	0.147	0.354	0.121	0.326	0.230	0.421
Highest parental education: Missing	0.017	0.129	0.012	0.107	0.035	0.183
Female (0/1)	0.483	0.500	0.483	0.500	0.481	0.500
Father Age	38.96	19.56	38.21	19.90	41.43	18.19
Mother Age	43.16	10.29	42.96	10.44	43.82	9.76
Immigrant (0/1)	0.234	0.423	0.000	0.000	1.000	0.000
Religion: Christian (0/1) (Reference)	0.879	0.326	0.912	0.284	0.774	0.418
Religion: Jewish (0/1)	0.003	0.052	0.001	0.035	0.008	0.088
Religion: Islamic (0/1)	0.019	0.135	0.002	0.048	0.072	0.259
Religion: Other or no denomination (0/1)	0.086	0.281	0.073	0.260	0.130	0.336
Religion: No response (0/1)	0.013	0.113	0.012	0.108	0.016	0.126
No Siblings (0/1) (Reference)	0.074	0.261	0.070	0.255	0.085	0.279
One Sibling (0/1)	0.467	0.499	0.456	0.498	0.504	0.500
Two Siblings (0/1)	0.305	0.460	0.311	0.463	0.285	0.451
Three or more Siblings (0/1)	0.155	0.361	0.163	0.370	0.126	0.332
Cantonal institutions of interest						
Share of 4-years-olds in kindergarten	0.156	0.221	0.131	0.194	0.236	0.276
Average age at kindergarten	5.373	0.433	5.425	0.383	5.200	0.531
Age at school entry	6.472	0.422	6.497	0.421	6.388	0.414
School tracking	5.909	0.796	5.894	0.745	5.958	0.944
Cantonal proxy variables						
Elementary school expenditures per capita	0.861	0.329	0.843	0.322	0.920	0.342
Total education expenditures per capita	2645	320	2618	284	2734	406
Teachers per 100 inhabitants	1.205	0.269	1.187	0.247	1.262	0.326
Class size: primary school	19.90	0.757	19.89	0.770	19.94	0.713
Class size: secondary school	18.94	0.925	18.93	0.937	18.98	0.886
Population share with higher degree	0.099	0.035	0.095	0.032	0.113	0.038
Population share with university degree	0.051	0.023	0.049	0.020	0.060	0.028
Population Density (communal)	0.011	0.017	0.009	0.014	0.018	0.024
French speaking region (0/1)	0.220	0.414	0.196	0.397	0.300	0.458
Italian speaking region (0/1)	0.032	0.175	0.024	0.153	0.056	0.231
Share of left wing parties in cantonal parliament	0.269	0.099	0.262	0.098	0.293	0.098
Population share in urban areas	0.385	0.197	0.371	0.189	0.429	0.217
Population (in 1000)	544.9	369.5	544.3	371.3	546.9	363.4
Gini: equivalent incomes 2003	0.284	0.035	0.282	0.035	0.292	0.036
Gini: equivalent incomes 1995	0.290	0.021	0.289	0.021	0.294	0.020
Degree of local autonomy	0.548	0.076	0.541	0.070	0.570	0.092
No. adv. schools per 1000 inhabitants (communal)	21.65	19.57	21.14	19.55	22.68	19.56
No. adv. schools per 1000 inhabitants: missing (com.)	0.704	0.456	0.742	0.437	0.581	0.493
Female labor force part. (full and part-time)	0.624	0.034	0.623	0.034	0.627	0.036
Female labor force part. (full time)	0.367	0.020	0.366	0.020	0.373	0.022
Number of observations	61676		47250		14426	

Source: Individual indicators: Swiss census 2000, first four cantonal indicators see information below Table 1, for remaining cantonal indicators see Müller Kucera and Stauffer (2003) and the Swiss Conference of Cantonal Ministers of Education (EDK 2000).

Table 4   Predictions of step 1 estimation - separate regression for three institutions - full sample

A. Share of 4 years olds in Kindergarten	1 P(high | low)	2 P(high | mid)	3 P(high | high)	Absolute Differences 4 (= 3 - 1)	5	6	7 (= 3 - 2)	8	9	Relative Differences 10 (= 3 / 1)	11	12	13 (= 3 / 2)	14	15
Low share of 4 years olds (mean - 1 SD = 0)	0.085 (0.068)	0.224 * (0.129)	0.574 *** (0.143)	0.489 *** (0.09)	-0.030 *** (0.01)		0.349 *** (0.046)	-0.019 ** (0.009)		6.751 ** (2.45)	-0.661 * (0.351)		2.557 ** (0.662)	-0.043 (0.068)	
Avg. share of 4 years olds (mean)	0.090 (0.07)	0.218 * (0.127)	0.549 *** (0.147)	0.459 *** (0.09)	-0.045 *** (0.013)	-0.075 *** (0.023)	0.330 *** (0.046)	-0.028 ** (0.012)	-0.047 ** (0.021)	6.090 ** (2.074)	-0.859 ** (0.431)	-1.519 * (0.88)	2.514 ** (0.622)	-0.072 (0.094)	-0.115 (0.162)
High share of 4 years olds (mean + 1 SD)	0.098 (0.074)	0.210 * (0.125)	0.512 *** (0.152)	0.414 *** (0.09)			0.302 *** (0.049)			5.231 *** (1.642)			2.442 *** (0.568)		

B. Age at school entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early school enrollment (mean - 1 SD)	0.111 * (0.066)	0.233 ** (0.112)	0.547 *** (0.133)	0.437 *** (0.075)	0.022 * (0.012)		0.314 *** (0.04)	0.019 ** (0.009)		4.949 *** (1.384)	1.165 ** (0.517)		2.344 *** (0.488)	0.195 ** (0.087)	
Average school enrollment (mean)	0.090 (0.056)	0.216 ** (0.108)	0.548 *** (0.134)	0.458 *** (0.084)	0.018 (0.013)	0.040 * (0.023)	0.332 *** (0.042)	0.017 * (0.009)	0.036 ** (0.018)	6.114 *** (1.805)	1.475 ** (0.724)	2.640 ** (1.238)	2.540 *** (0.554)	0.215 ** (0.101)	0.411 ** (0.188)
Late school enrollment (mean + 1 SD)	0.072 (0.048)	0.199 * (0.104)	0.549 *** (0.135)	0.476 *** (0.093)			0.349 *** (0.046)			7.590 *** (2.426)			2.755 *** (0.634)		

C. Grade of school tracking	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early tracking (mean - 1 SD)	0.103 (0.077)	0.232 * (0.131)	0.579 *** (0.144)	0.475 *** (0.081)	-0.054 ** (0.022)		0.347 *** (0.044)	-0.040 * (0.021)		5.602 ** (1.943)	0.122 (0.474)		2.493 ** (0.627)	0.007 (0.103)	
Average tracking (mean)	0.089 (0.07)	0.204 * (0.123)	0.511 *** (0.149)	0.422 *** (0.09)	-0.066 *** (0.02)	-0.119 *** (0.041)	0.307 *** (0.047)	-0.043 ** (0.019)	-0.083 ** (0.039)	5.724 *** (1.818)	-0.631 ** (0.312)	-0.509 (0.968)	2.500 ** (0.585)	-0.029 (0.117)	-0.022 (0.218)
Late tracking (mean + 1 SD)	0.087 (0.064)	0.179 (0.114)	0.443 *** (0.152)	0.356 *** (0.097)			0.264 *** (0.053)			5.093 ** (1.786)			2.471 *** (0.549)		

Note: Columns 1-3 present the average predicted probability of attending advanced school for the full sample after setting parental education indicators to low (column1), medium (column 2), and high (column 3). Each row assumes a separate institutional framework with early, average and late entry to kindergarten, entry to school, or secondary school tracking. Cantonal average values are used as average indicators, for the early and late regimes one standard deviation (SD) of the value is deducted or added. Columns 4 and 7 present the absolute differences, columns 10 and 13 present ratios of predicted probabilities. Columns 5, 8, 11, and 14 present the difference between entries in neighboring rows in the preceding columns 4, 7, 10, and 13, respectively. Similarly, columns 6, 9, 12, and 15 present the difference between entries in neighboring rows in the preceding columns 5, 8, 11, and 14, respectively. In parentheses are standard errors bootstrapped with 600 repeated draws. If fewer than 3 digits are presented, then the missing digits are equal to zero. ***, **, and * indicate statistical significance of the presented figures at the 1, 5, and 10 percent level, respectively. All entries are tested for significant difference from zero except for those in columns 10 and 13, which are tested for difference from one.

Source: See Table 3.

Table 5   Predictions of step 2 estimation - joint regression for three institutions - full sample

A. Share of 4 years olds in Kindergarten	1 P(high | low)	2 P(high | mid)	3 P(high | high)	Absolute Differences 4 = 3 - 1	5	6	7 = 3 - 2	8	9	Relative Differences 10 = 3 / 1	11	12	13 = 3 / 2	14	15
Low share of 4 years olds	0.073 *	0.204 **	0.549 ***	0.476 ***			0.345 ***			7.550 ***			2.689 ***		
(mean - 1 SD = 0)	(0.039)	(0.094)	(0.123)	(0.089)	-0.010		(0.045)	-0.007		(2.237)	-1.147 **		(0.608)	-0.112	
					(0.013)			(0.008)			(0.49)			(0.079)	
Avg. share of 4 years olds	0.086 *	0.214 **	0.552 ***	0.466 ***		-0.038 **	0.338 ***		-0.017	6.403 ***		-2.899 ***	2.577 ***		-0.265 *
(mean)	(0.045)	(0.096)	(0.123)	(0.084)	-0.028 ***	(0.017)	(0.043)	-0.010	(0.019)	(1.855)	-1.752 ***	(1.011)	(0.574)	-0.153	(0.159)
					(0.01)			(0.011)			(0.525)			(0.1)	
High share of 4 years olds	0.120 **	0.230 **	0.557 ***	0.438 ***			0.327 ***			4.650 **			2.424 ***		
(mean + 1 SD)	(0.056)	(0.102)	(0.126)	(0.078)			(0.042)			(1.46)			(0.539)		

B. Age at school entry

B. Age at school entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early school enrollment	0.102	0.234 **	0.566 ***	0.464 ***			0.333 ***			5.542 *			2.425 ***		
(mean - 1 SD)	(0.072)	(0.104)	(0.12)	(0.073)	-0.003		(0.043)	0.004		(2.372)	0.467		(0.552)	0.139 *	
					(0.013)			(0.011)			(0.44)			(0.079)	
Average school enrollment	0.092	0.216 **	0.553 ***	0.461 ***		0.002	0.337 ***		0.008	6.009 **		1.877 *	2.564 ***		0.289 **
(mean)	(0.067)	(0.098)	(0.12)	(0.075)	0.006	(0.025)	(0.044)	0.003	(0.021)	(2.453)	1.410 ***	(0.958)	(0.59)	0.150 *	(0.143)
					(0.012)			(0.011)			(0.519)			(0.09)	
Late school enrollment	0.073	0.199 **	0.539 ***	0.467 ***			0.341 ***			7.419 **			2.715 ***		
(mean + 1 SD)	(0.063)	(0.093)	(0.12)	(0.079)			(0.046)			(2.628)			(0.639)		

C. Grade of school tracking

C. Grade of school tracking	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early tracking	0.113	0.234 *	0.580 ***	0.467 ***			0.345 ***			5.142			2.474 **		
(mean - 1 SD)	(0.103)	(0.124)	(0.13)	(0.076)	-0.029		(0.047)	-0.026		(2.55)	1.081		(0.67)	0.099	
					(0.03)			(0.02)			(0.872)			(0.12)	
Average tracking	0.084	0.203 *	0.522 ***	0.438 ***		-0.065	0.319 ***		-0.056	6.223 *		2.381	2.573 **		0.180
(mean)	(0.084)	(0.115)	(0.133)	(0.081)	-0.036	(0.056)	(0.05)	-0.030	(0.039)	(3.106)	1.300	(2.078)	(0.678)	0.081	(0.255)
					(0.027)			(0.019)			(1.215)			(0.137)	
Late tracking	0.062	0.175 *	0.464 ***	0.402 ***			0.289 ***			7.523			2.654 **		
(mean + 1 SD)	(0.067)	(0.105)	(0.135)	(0.09)			(0.056)			(3.969)			(0.7)		

Notes: see Table 4   Source: see Table 3, based on estimation results presented in Table A.1.

Table 6   Predictions of step 2 estimation - joint regression for three institutions - native subsample

A. Share of 4 years olds in Kindergarten	1 P(high | low)	2 P(high | mid)	3 P(high | high)	Absolute Differences 4 = 3 - 1	5	6	7 = 3 - 2	8	9	Relative Differences 10 = 3 / 1	11	12	13 = 3 / 2	14	15
Low share of 4 years olds (mean - 1 SD = 0)	0.063 * (0.035)	0.204 ** (0.09)	0.560 *** (0.118)	0.497 *** (0.088)	-0.003 (0.011)		0.356 *** (0.044)	-0.005 (0.008)		8.935 ** (3.143)	-0.838 * (0.433)		2.749 *** (0.642)	-0.092 (0.096)	
Avg. share of 4 years olds (mean)	0.070 * (0.036)	0.212 ** (0.091)	0.564 *** (0.117)	0.494 *** (0.086)	-0.016 (0.016)	-0.019 (0.028)	0.352 *** (0.041)	-0.007 (0.011)	-0.012 (0.019)	8.097 *** (2.734)	-1.841 ** (0.731)	-2.679 ** (1.362)	2.656 *** (0.603)	-0.128 (0.12)	-0.220 (0.216)
High share of 4 years olds (mean + 1 SD)	0.091 ** (0.04)	0.225 ** (0.093)	0.570 *** (0.118)	0.479 *** (0.085)			0.345 *** (0.04)			6.256 ** (2.343)			2.529 *** (0.568)		

B. Age at school entry															
Early school enrollment (mean - 1 SD)	0.081 * (0.044)	0.230 ** (0.092)	0.573 *** (0.109)	0.492 *** (0.073)	0.000 (0.013)		0.343 *** (0.043)	0.008 (0.011)		7.078 ** (2.71)	0.787 (0.558)		2.489 *** (0.57)	0.156 * (0.081)	
Average school enrollment (mean)	0.072 * (0.038)	0.213 ** (0.087)	0.564 *** (0.109)	0.492 *** (0.077)	0.001 (0.012)	0.001 (0.025)	0.351 *** (0.042)	0.007 (0.011)	0.015 (0.023)	7.864 ** (2.822)	1.170 ** (0.479)	1.956 * (1.136)	2.645 *** (0.603)	0.170 * (0.09)	0.326 * (0.171)
Late school enrollment (mean + 1 SD)	0.061 * (0.033)	0.197 ** (0.083)	0.555 *** (0.11)	0.494 *** (0.082)			0.358 *** (0.044)			9.034 *** (3.057)			2.815 *** (0.647)		

C. Grade of school tracking															
Early tracking (mean - 1 SD)	0.085 (0.072)	0.228 * (0.118)	0.591 *** (0.125)	0.506 *** (0.077)	-0.040 (0.029)		0.362 *** (0.046)	-0.032 (0.021)		6.967 * (3.514)	0.943 (1.482)		2.586 ** (0.714)	0.042 (0.157)	
Average tracking (mean)	0.068 (0.06)	0.203 * (0.112)	0.534 *** (0.13)	0.466 *** (0.084)	-0.044 * (0.026)	-0.083 (0.055)	0.331 *** (0.047)	-0.035 * (0.02)	-0.066 (0.041)	7.909 * (3.608)	1.012 (1.771)	1.955 (3.235)	2.628 ** (0.709)	0.018 (0.17)	0.060 (0.325)
Late tracking (mean + 1 SD)	0.053 (0.05)	0.180 * (0.106)	0.476 *** (0.134)	0.423 *** (0.094)			0.296 *** (0.053)			8.921 * (4.448)			2.646 ** (0.733)		

Notes: see Table 4   Source: See Table 3, based on estimation results presented in Table A.1.

Table 7   Predictions of step 2 estimation - joint regression for three institutions - immigrant subsample

A. Share of 4 years olds in Kindergarten				Absolute Differences						Relative Differences					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	P(high | low)	P(high | mid)	P(high | high)	= 3 - 1			= 3 - 2			= 3 / 1			= 3 / 2		
Low share of 4 years olds (mean - 1 SD = 0)	0.091 ** (0.045)	0.205 ** (0.082)	0.527 *** (0.118)	0.436 *** (0.08)	-0.009 (0.012)		0.322 *** (0.049)	-0.008 (0.008)		5.791 *** (1.578)	-0.769 ** (0.368)		2.576 *** (0.489)	-0.139 * (0.072)	
Avg. share of 4 years olds (mean)	0.106 ** (0.05)	0.219 *** (0.084)	0.533 *** (0.118)	0.427 *** (0.076)	-0.017 (0.017)	-0.027 (0.029)	0.314 *** (0.047)	-0.013 (0.011)	-0.022 (0.019)	5.022 *** (1.283)	-0.909 *** (0.309)	-1.678 *** (0.565)	2.437 *** (0.434)	-0.183 * (0.102)	-0.322 (0.204)
High share of 4 years olds (mean + 1 SD)	0.131 ** (0.058)	0.240 *** (0.089)	0.541 *** (0.122)	0.409 *** (0.072)			0.301 *** (0.046)			4.114 *** (0.984)			2.253 *** (0.381)		
B. Age at school entry															
Early school enrollment (mean - 1 SD)	0.124 * (0.068)	0.241 *** (0.092)	0.556 *** (0.107)	0.432 *** (0.061)	-0.009 (0.014)		0.315 *** (0.045)	-0.002 (0.012)		4.474 ** (1.669)	0.332 * (0.18)		2.307 *** (0.494)	0.114 * (0.06)	
Average school enrollment (mean)	0.111 * (0.059)	0.221 ** (0.086)	0.534 *** (0.107)	0.423 *** (0.064)	-0.004 (0.013)	-0.013 (0.027)	0.314 *** (0.045)	-0.003 (0.012)	-0.005 (0.024)	4.807 ** (1.63)	0.689 ** (0.314)	1.021 ** (0.503)	2.421 *** (0.5)	0.120 * (0.068)	0.234 * (0.128)
Late school enrollment (mean + 1 SD)	0.093 * (0.052)	0.201 ** (0.08)	0.512 *** (0.108)	0.419 *** (0.069)			0.310 *** (0.047)			5.495 *** (1.63)			2.541 *** (0.511)		
C. Grade of school tracking															
Early tracking (mean - 1 SD)	0.137 (0.121)	0.253 * (0.137)	0.565 *** (0.138)	0.428 *** (0.069)	-0.030 (0.036)		0.312 *** (0.049)	-0.013 (0.028)		4.120 * (1.789)	0.876 (0.863)		2.236 ** (0.555)	0.277 (0.186)	
Average tracking (mean)	0.100 (0.098)	0.198 (0.122)	0.498 *** (0.139)	0.398 *** (0.069)	-0.039 (0.032)	-0.069 (0.068)	0.300 *** (0.05)	-0.022 (0.026)	-0.035 (0.053)	4.996 * (2.299)	1.054 (1.302)	1.930 (2.154)	2.513 ** (0.659)	0.309 (0.254)	0.586 (0.437)
Late tracking (mean + 1 SD)	0.071 (0.076)	0.152 (0.106)	0.430 *** (0.138)	0.359 *** (0.079)			0.278 *** (0.06)			6.050 (3.258)			2.822 ** (0.822)		

Notes: see Table 4   Source: See Table 3, based on estimation results presented in Table A.1.

Appendix

Table A.1 Estimation results: multinomial logit regression - joint regression for three institutions - full sample without and with immigrant interaction terms

	Model 1		Model 2			
			All		SGI Interaction Terms	
	Low	High	Low	High	Low	High
Individual Indicators						
Highest parental education: Low	0.647	-0.326	0.430	-0.487	-	-
	(0.707)	(0.904)	(0.728)	(0.936)	-	-
Highest parental education: High	0.558	1.212 **	0.552	1.159 *	-	-
	(1.005)	(0.587)	(1.018)	(0.597)	-	-
Highest parental education: Missing	2.196	-3.394	2.539	-3.808	-	-
	(1.569)	(2.576)	(1.573)	(2.608)	-	-
Father Age	-0.009 ***	0.004 ***	-0.008 ***	0.004 ***	-	-
	(0.001)	(0.001)	(0.001)	(0.001)	-	-
Mother Age	-0.006 ***	0.019 ***	-0.006 ***	0.019 ***	-	-
	(0.001)	(0.001)	(0.001)	(0.001)	-	-
Religion: Jewish (0/1)	1.347 ***	0.773 ***	1.318 ***	0.801 ***	-	-
	(0.237)	(0.212)	(0.237)	(0.212)	-	-
Religion: Islamic (0/1)	0.841 ***	0.015	0.875 ***	-0.007	-	-
	(0.075)	(0.102)	(0.076)	(0.101)	-	-
Religion: Other or no denomination (0/1)	0.487 ***	0.336 ***	0.478 ***	0.340 ***	-	-
	(0.047)	(0.037)	(0.047)	(0.037)	-	-
Religion: No response (0/1)	1.192 ***	-0.228 **	1.192 ***	-0.230 **	-	-
	(0.089)	(0.106)	(0.089)	(0.106)	-	-
One Sibling (0/1)	-0.249 ***	-0.179 ***	-0.244 ***	-0.181 ***	-	-
	(0.052)	(0.041)	(0.052)	(0.041)	-	-
Two Siblings (0/1)	-0.170 ***	-0.208 ***	-0.16 ***	-0.212 ***	-	-
	(0.054)	(0.043)	(0.054)	(0.043)	-	-
Three or more Siblings (0/1)	-0.116 *	-0.295 ***	-0.108 *	-0.298 ***	-	-
	(0.06)	(0.048)	(0.06)	(0.048)	-	-
Female (0/1)	0.329 ***	0.594 ***	0.329 ***	0.595 ***	-	-
	(0.028)	(0.021)	(0.028)	(0.021)	-	-
Second Generation Immigrant (0/1)	0.342 ***	0.099 ***	0.888	1.063 *	-	-
	(0.035)	(0.027)	(0.679)	(0.568)	-	-
Cantonal Institutions (main and interaction effects)						
Share of 4-years-olds in kindergarten	-0.007	0.403	0.063	0.342	-0.393 *	0.164
	(0.496)	(0.369)	(0.501)	(0.371)	(0.229)	(0.161)
Share 4 years * Highest p. education: Low	-0.477 **	0.710 ***	-0.231	0.342	-0.001	0.155
	(0.195)	(0.199)	(0.282)	(0.331)	(0.379)	(0.394)
Share 4 years * Highest p. education: High	0.113	-0.293 **	0.225	-0.192	-0.059	-0.200
	(0.24)	(0.147)	(0.32)	(0.188)	(0.422)	(0.269)
Share 4 years * Highest p. education: Missing	-0.718 *	1.743 ***	-0.614	1.591 **	0.383	-0.034
	(0.397)	(0.507)	(0.585)	(0.806)	(0.728)	(0.895)
Age at school entry	-0.068	-0.265 ***	-0.059	-0.252 ***	-0.035	-0.05
	(0.099)	(0.078)	(0.101)	(0.079)	(0.1)	(0.084)
Age school entry * Highest p. education: Low	-0.043	-0.042	-0.037	-0.084	0.024	0.052
	(0.096)	(0.131)	(0.102)	(0.14)	(0.079)	(0.079)
Age school entry * Highest p. education: High	-0.075	0.094	-0.068	0.130	-0.035	-0.101 *
	(0.141)	(0.082)	(0.147)	(0.084)	(0.108)	(0.061)
Age school entry * Highest p. education: Missing	-0.017	0.323	0.047	0.317	-0.230	0.027
	(0.209)	(0.377)	(0.219)	(0.394)	(0.187)	(0.22)
Grade school tracking	-0.028	-0.117 ***	-0.028	-0.095 **	-0.019	-0.112 ***
	(0.053)	(0.039)	(0.055)	(0.04)	(0.059)	(0.036)
Grade tracking * Highest p. education: Low	0.042	-0.091 **	0.086	-0.044	-0.082	0.006
	(0.048)	(0.043)	(0.062)	(0.072)	(0.091)	(0.089)
Grade tracking * Highest p. education: High	0.093	-0.012	0.081	-0.036	0.027	0.090
	(0.064)	(0.035)	(0.084)	(0.044)	(0.124)	(0.07)
Grade tracking * Highest p. education: Missing	-0.145	0.027	-0.227	0.072	0.119	0.031
	(0.118)	(0.123)	(0.151)	(0.189)	(0.214)	(0.246)

Cantonal Proxy Variables

Elementary school expenditure per capita	0.333 **	0.164	0.320 **	0.162	-	-
	(0.13)	(0.101)	(0.131)	(0.101)	-	-
Total education expenditure per capita	-0.165	0.164	-0.151	-0.110	-	-
	(0.180)	(0.101)	(0.181)	(0.134)	-	-
Teachers per 100 inhabitants	-0.245	0.267 **	-0.234	0.268 **	-	-
	(0.163)	(0.127)	(0.163)	(0.127)	-	-
Class size: primary school	-0.068	-0.216 ***	-0.066	-0.211 ***	-	-
	(0.047)	(0.036)	(0.047)	(0.036)	-	-
Class size: secondary school	0.106 **	0.082 **	0.106 **	0.079 **	-	-
	(0.05)	(0.039)	(0.05)	(0.039)	-	-
Population share with higher degree	2.630	8.105 ***	2.122	8.378 ***	-	-
	(3.648)	(2.766)	(3.664)	(2.776)	-	-
Population share with university degree	9.580	0.541	10.060	0.252	-	-
	(8.862)	(6.642)	(8.896)	(6.659)	-	-
Population Density (communal)	6.347 ***	5.282 ***	6.574 ***	5.094 ***	-	-
	(1.21)	(0.909)	(1.213)	(0.911)	-	-
French speaking region (0/1)	-0.692 ***	0.010	-0.686 ***	-0.001	-	-
	(0.261)	(0.2)	(0.262)	(0.2)	-	-
Italian speaking region (0/1)	-1.318 **	0.210	-1.231 **	0.243	-	-
	(0.577)	(0.429)	(0.579)	(0.43)	-	-
Share of left wing politicians in cantonal parliament	1.218 *	-0.095	1.224 *	-0.107	-	-
	(0.661)	(0.52)	(0.662)	(0.521)	-	-
Population share in urban areas	-0.169	-0.173	-0.169	-0.149	-	-
	(0.296)	(0.213)	(0.298)	(0.214)	-	-
Population	-4.845 ***	-5.628 ***	-5.528 ***	-4.889 ***	-	-
	(0.939)	(1.216)	(1.22)	(0..94)	-	-
Gini: equivalent incomes 2003	-5.199 ***	-3.891 ***	-5.138 ***	-3.783 ***	-	-
	(1.281)	(0.948)	(1.284)	(0.949)	-	-
Gini: equivalent incomes 1995	5.729 **	6.576 ***	5.652 *	6.332 ***	-	-
	(2.911)	(2.17)	(2.916)	(2.174)	-	-
Degree of local autonomy	-0.605	-1.045 *	-0.559	-1.036 *	-	-
	(0.701)	(0.554)	(0.701)	(0.555)	-	-
No. adv. schools per 1000 inhabitants (communal)	0.001	0.001	0.001	0.001	-	-
	(0.001)	(0.001)	(0.001)	(0.001)	-	-
No. adv. schools per 1000 inhabitants: missing (c.)	-0.693	-1.333	-0.657	-1.309	-	-
	(1.31)	(0.96)	(1.311)	(0.96)	-	-
Female labor force partic. (full- and part-time)	-4.089	-1.799	-3.988	-1.916	-	-
	(2.512)	(2.058)	(2.513)	(2.061)	-	-
Female labor force partic. (full-time)	4.753 *	0.473	4.724 *	0.433	-	-
	(2.493)	(1.89)	(2.494)	(1.891)	-	-
Intercept	-0.754	2.808 *	-0.987	2.671 *	-	-
	(1.805)	(1.532)	(1.812)	(1.537)	-	-

Joint Significance Tests

Highest p. ed. * Share of 4-yrs-olds in KG	chi2(6)=56.1	p=0.000	chi2(6)=12.4	p=0.054	chi2(6)=1.2	p=0.975
Highest p. ed. * Age at school entry	chi2(6)=3.2	p=0.786	chi2(6)=4.7	p=0.587	chi2(6)=5.6	p=0.469
Highest p. ed. * School tracking	chi2(6)=10.5	p=0.106	chi2(6)=7.9	p=0.249	chi2(6)=3.1	p=0.796
Highest p. ed. * Share of 4-yrs-olds in KG (incl. level)	chi2(8)=57.2	p=0.000	chi2(8)=13.1	p=0.108	chi2(10)=8.4	p=0.393
Highest p. ed. * Age at school entry (incl. level)	chi2(8)=13.8	p=0.087	chi2(8)=13.6	p=0.093	chi2(10)=6.5	p=0.596
Highest p. ed. * School tracking (incl. level)	chi2(8)=21.6	p=0.006	chi2(8)=14.8	p=0.062	chi2(10)=13.3	p=0.103

Number of observations	61,676	61,676
Log Likelihood	-46,180.07	-46,160.49

Source: See Table 3.

Table A.2   Predictions of step 2 estimation - joint regression for three institutions - separate model: native subsample

A. Share of 4 years olds in Kindergarten	1	2	3	Absolute Differences 4	5	6	7	8	9	Relative Differences 10	11	12	13	14	15
	P(high | low)	P(high | mid)	P(high | high)	= 3 - 1			= 3 - 2			= 3 / 1			= 3 / 2		
Low share of 4 years olds (mean - 1 SD = 0)	0.057 *	0.191 **	0.543 ***	0.487 ***			0.352 ***			9.587 ***			2.839 ***		
	(0.032)	(0.093)	(0.113)	(0.087)	0.003		(0.042)	0.000		(2.798)	-1.092		(0.679)	-0.101	
					(0.016)			(0.012)			(0.7)			(0.086)	
Avg. share of 4 years olds (mean)	0.065 *	0.203 **	0.555 ***	0.490 ***		-0.004	0.353 ***		-0.010	8.495 ***		-2.568 **	2.738 ***		-0.285
	(0.034)	(0.096)	(0.111)	(0.082)	-0.008	(0.039)	(0.04)	-0.010	(0.028)	(2.408)	-1.477 **	(1.265)	(0.649)	-0.184 *	(0.2)
					(0.023)			(0.016)			(0.667)			(0.105)	
High share of 4 years olds (mean + 1 SD)	0.080 *	0.220 **	0.562 ***	0.482 ***			0.342 ***			7.018 ***			2.554 **		
	(0.041)	(0.103)	(0.112)	(0.078)			(0.044)			(2.109)			(0.62)		
B. Age at school entry															
Early school enrollment (mean - 1 SD)	0.072	0.223 **	0.561 ***	0.489 ***			0.339 ***			7.759 ***			2.520 ***		
	(0.061)	(0.111)	(0.114)	(0.074)	-0.003		(0.043)	0.012		(3)	0.508		(0.566)	0.202 **	
					(0.014)			(0.012)			(1.114)			(0.097)	
Average school enrollment (mean)	0.067	0.203 *	0.554 ***	0.487 ***		-0.004	0.350 ***		0.022	8.266 **		1.197	2.723 ***		0.427 **
	(0.055)	(0.104)	(0.112)	(0.074)	-0.002	(0.027)	(0.044)	0.010	(0.024)	(3.212)	0.689	(2.419)	(0.625)	0.225 **	(0.21)
					(0.013)			(0.012)			(1.309)			(0.113)	
Late school enrollment (mean + 1 SD)	0.061	0.185 *	0.546 ***	0.485 ***			0.360 ***			8.955 **			2.948 ***		
	(0.051)	(0.097)	(0.112)	(0.077)			(0.047)			(3.916)			(0.7)		
C. Grade of school tracking															
Early tracking (mean - 1 SD)	0.076	0.218 *	0.580 ***	0.504 ***			0.362 ***			7.614 **			2.663 **		
	(0.083)	(0.131)	(0.125)	(0.077)	-0.043		(0.052)	-0.030		(3.149)	0.779		(0.742)	0.074	
					(0.03)			(0.027)			(1.319)			(0.151)	
Average tracking (mean)	0.062	0.191	0.523 ***	0.460 ***		-0.089	0.332 ***		-0.064	8.392 **		1.565	2.737 **		0.128
	(0.072)	(0.122)	(0.13)	(0.083)	-0.046 *	(0.056)	(0.051)	-0.033	(0.051)	(3.568)	0.786	(2.887)	(0.765)	0.054	(0.337)
					(0.026)			(0.025)			(1.583)			(0.187)	
Late tracking (mean + 1 SD)	0.051	0.167	0.465 ***	0.414 ***			0.299 ***			9.178 *			2.791 **		
	(0.063)	(0.113)	(0.137)	(0.093)			(0.06)			(4.461)			(0.81)		

Notes: see Table 4   Source: See Table 3, based on separate estimations for native subsample.

Table A.3 Predictions of step 2 estimation - joint regression for three institutions - separate model: immigrant subsample

A. Share of 4 years olds in Kindergarten	1 P(high |low)	2 P(high |mid)	3 P(high |high)	Absolute Differences 4 =3-1	5	6	7 =3-2	8	9	Relative Differences 10 =3/1	11	12	13 =3/2	14	15
Low share of 4 years olds (mean - 1 SD = 0)	0.128 * (0.072)	0.255 ** (0.113)	0.585 *** (0.14)	0.457 *** (0.078)	-0.026 ** (0.012)		0.330 *** (0.045)	-0.020 * (0.012)		4.587 ** (1.774)	-0.440 * (0.235)		2.293 ** (0.578)	-0.091 (0.129)	
Avg. share of 4 years olds (mean)	0.137 * (0.075)	0.258 ** (0.115)	0.568 *** (0.144)	0.431 *** (0.077)	-0.040 * (0.022)	-0.066 ** (0.034)	0.310 *** (0.045)	-0.029 ** (0.014)	-0.049 ** (0.025)	4.147 ** (1.557)	-0.564 ** (0.258)	-1.004 * (0.611)	2.202 ** (0.517)	-0.131 (0.153)	-0.222 (0.281)
High share of 4 years olds (mean + 1 SD)	0.151 * (0.085)	0.262 ** (0.122)	0.543 *** (0.158)	0.391 *** (0.081)			0.281 *** (0.049)			3.583 * (1.395)			2.071 ** (0.469)		

B. Age at school entry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early school enrollment (mean - 1 SD)	0.154 (0.102)	0.260 * (0.134)	0.570 *** (0.135)	0.416 *** (0.064)	0.001 (0.022)		0.310 *** (0.048)	-0.010 (0.018)		3.693 (1.731)	0.207 (0.417)		2.195 * (0.678)	-0.039 (0.135)	
Average school enrollment (mean)	0.144 (0.097)	0.260 * (0.134)	0.561 *** (0.134)	0.417 *** (0.066)	-0.002 (0.022)	0.000 (0.043)	0.301 *** (0.044)	-0.012 (0.018)	-0.022 (0.035)	3.900 (1.825)	0.219 (0.467)	0.427 (0.881)	2.156 * (0.624)	-0.048 (0.126)	-0.087 (0.261)
Late school enrollment (mean + 1 SD)	0.133 (0.095)	0.260 * (0.135)	0.549 *** (0.137)	0.416 *** (0.073)			0.288 *** (0.045)			4.119 (2.016)			2.108 * (0.593)		

C. Grade of school tracking	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early tracking (mean - 1 SD)	0.183 (0.158)	0.293 * (0.16)	0.596 *** (0.14)	0.413 *** (0.076)	-0.017 (0.051)		0.303 *** (0.054)	-0.012 (0.034)		3.260 (1.887)	0.744 (0.925)		2.032 * (0.614)	0.192 (0.21)	
Average tracking (mean)	0.132 (0.129)	0.238 (0.148)	0.529 *** (0.154)	0.397 *** (0.077)	-0.031 (0.049)	-0.048 (0.099)	0.291 *** (0.054)	-0.022 (0.033)	-0.034 (0.066)	4.004 (2.546)	0.930 (1.336)	1.674 (2.237)	2.224 * (0.704)	0.198 (0.261)	0.390 (0.465)
Late tracking (mean + 1 SD)	0.093 (0.096)	0.189 (0.135)	0.458 *** (0.167)	0.365 *** (0.099)			0.269 *** (0.068)			4.934 (3.549)			2.422 * (0.836)		

Notes: see Table 4   Source: See Table 3, based on estimations for immigrant subsample.

Table A.4   Predictions of step 2 estimation- joint regression for three institutions - full sample - using average age in kindergarten

A. Average age in Kindergarten	1 P(high | low)	2 P(high | mid)	3 P(high | high)	4 = 3 - 1	5 (Abs. Diff.)	6 (Abs. Diff.)	7 = 3 - 2	8 (Abs. Diff.)	9 (Abs. Diff.)	10 = 3 / 1	11 (Rel. Diff.)	12 (Rel. Diff.)	13 = 3 / 2	14 (Rel. Diff.)	15 (Rel. Diff.)
Low average age (mean - 1 SD)	0.096	0.256 **	0.572 ***	0.476 ***	-0.020		0.316 ***	-0.016		5.953 ***	-0.704 *		2.235 **	-0.094	
	(0.072)	(0.128)	(0.156)	(0.093)	(0.023)		(0.052)	(0.024)		(1.759)	(0.416)		(0.62)	(0.129)	
Average age (mean)	0.107	0.263 *	0.563 ***	0.456 ***	-0.051 *	-0.071	0.300 ***	-0.033	-0.049	5.249 *	-1.263 ***	-1.967 **	2.141 *	-0.167	-0.260
	(0.081)	(0.141)	(0.148)	(0.085)	(0.027)	(0.05)	(0.048)	(0.026)	(0.05)	(2.277)	(0.411)	(0.848)	(0.672)	(0.139)	(0.265)
High average age (mean + 1 SD)	0.136	0.274 *	0.540 ***	0.405 ***			0.267 ***			3.986			1.975		
	(0.092)	(0.153)	(0.139)	(0.078)			(0.054)			(2.94)			(0.723)		

B. Age at school entry

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early school enrollment (mean - 1 SD)	0.124 **	0.285 ***	0.583 ***	0.460 ***	-0.005		0.299 ***	0.004		4.717	0.394		2.048 *	0.099	
	(0.061)	(0.096)	(0.109)	(0.066)	(0.012)		(0.044)	(0.01)		(2.285)	(0.373)		(0.58)	(0.067)	
Average school enrollment (mean)	0.111 **	0.263 ***	0.566 ***	0.455 ***	0.014	0.009	0.302 ***	0.012	0.016	5.112 *	1.163 ***	1.557 *	2.147 *	0.146 **	0.245 *
	(0.055)	(0.092)	(0.11)	(0.07)	(0.012)	(0.024)	(0.043)	(0.01)	(0.02)	(2.3)	(0.43)	(0.802)	(0.596)	(0.072)	(0.139)
Late school enrollment (mean + 1 SD)	0.089 *	0.243 ***	0.558 ***	0.469 ***			0.314 ***			6.274 **			2.293 **		
	(0.05)	(0.09)	(0.111)	(0.074)			(0.044)			(2.377)			(0.619)		

C. Grade of school tracking

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Early tracking (mean - 1 SD)	0.128	0.278 **	0.587 ***	0.459 ***	-0.023		0.309 ***	-0.022		4.586	0.628		2.113 *	0.026	
	(0.098)	(0.118)	(0.127)	(0.071)	(0.026)		(0.045)	(0.016)		(2.594)	(0.869)		(0.663)	(0.118)	
Average tracking (mean)	0.103	0.252 **	0.540 ***	0.436 ***	-0.029	-0.052	0.287 ***	-0.025	-0.047	5.214	0.694	1.322	2.138 *	0.010	0.035
	(0.081)	(0.112)	(0.128)	(0.072)	(0.024)	(0.051)	(0.045)	(0.015)	(0.031)	(3.008)	(1.179)	(2.042)	(0.673)	(0.129)	(0.245)
Late tracking (mean + 1 SD)	0.083	0.228 **	0.490 ***	0.407 ***			0.262 ***			5.908			2.148		
	(0.066)	(0.107)	(0.129)	(0.079)			(0.049)			(3.752)			(0.701)		

Notes: see Table 4   Source: See Table 3.

Table A.5   Predictions of step 2 estimation- joint regression for three institutions - full sample - using maternal education

A. Share of 4 years olds in Kindergarten	1 P(high | low)	2 P(high | mid)	3 P(high | high)	Absolute Differences 4 = 3 - 1	5	6	7 = 3 - 2	8	9	Relative Differences 10 = 3 / 1	11	12	13 = 3 / 2	14	15
Low share of 4 years olds (mean - 1 SD = 0)	0.096 (0.064)	0.256 ** (0.121)	0.572 *** (0.136)	0.476 *** (0.086)	-0.020 * (0.011)		0.316 *** (0.047)	-0.016 * (0.008)		5.953 ** (1.925)	-0.704 * (0.392)		2.235 ** (0.488)	-0.094 (0.079)	
Avg. share of 4 years olds (mean)	0.107 (0.065)	0.263 ** (0.12)	0.563 *** (0.136)	0.456 *** (0.083)	-0.041 *** (0.015)	-0.061 ** (0.026)	0.300 *** (0.044)	-0.023 ** (0.011)	-0.039 ** (0.019)	5.249 *** (1.602)	-1.189 ** (0.44)	-1.893 * (0.831)	2.141 *** (0.432)	-0.130 (0.1)	-0.224 (0.178)
High share of 4 years olds (mean + 1 SD)	0.136 ** (0.068)	0.274 ** (0.119)	0.550 *** (0.139)	0.415 *** (0.08)			0.277 *** (0.042)			4.060 ** (1.252)			2.011 *** (0.367)		
B. Age at school entry															
Early school enrollment (mean - 1 SD)	0.124 * (0.072)	0.285 ** (0.113)	0.583 *** (0.121)	0.460 *** (0.076)	-0.005 (0.018)		0.299 *** (0.055)	0.004 (0.015)		4.717 ** (1.816)	0.394 (0.276)		2.048 ** (0.445)	0.099 (0.077)	
Average school enrollment (mean)	0.111 * (0.065)	0.263 ** (0.108)	0.566 *** (0.119)	0.455 *** (0.074)	-0.006 (0.017)	-0.011 (0.035)	0.302 *** (0.048)	0.002 (0.015)	0.006 (0.03)	5.112 ** (1.911)	0.427 (0.321)	0.821 (0.597)	2.147 ** (0.46)	0.105 (0.087)	0.204 (0.163)
Late school enrollment (mean + 1 SD)	0.099 * (0.058)	0.243 ** (0.104)	0.548 *** (0.118)	0.449 *** (0.075)			0.304 *** (0.044)			5.539 ** (2.04)			2.252 ** (0.487)		
C. Grade of school tracking															
Early tracking (mean - 1 SD)	0.128 (0.105)	0.278 ** (0.137)	0.587 *** (0.135)	0.459 *** (0.073)	-0.023 (0.029)		0.309 *** (0.049)	-0.022 (0.022)		4.586 * (2.165)	0.628 (0.612)		2.113 ** (0.51)	0.026 (0.103)	
Average tracking (mean)	0.103 (0.093)	0.252 * (0.132)	0.540 *** (0.137)	0.436 *** (0.077)	-0.029 (0.027)	-0.052 (0.056)	0.287 *** (0.05)	-0.025 (0.021)	-0.047 (0.042)	5.214 * (2.436)	0.694 (0.776)	1.322 (1.381)	2.138 ** (0.518)	0.010 (0.119)	0.035 (0.22)
Late tracking (mean + 1 SD)	0.083 (0.08)	0.228 * (0.127)	0.490 *** (0.14)	0.407 *** (0.086)			0.262 *** (0.057)			5.908 * (2.877)			2.148 ** (0.544)		

Notes: see Table 4   Source: See Table 3.

Table A.6 Predictions of step 2 estimation - joint regression for three institutions - German language region based on interacted model

A. Share of 4 years olds in Kindergarten	1 P(high | low)	2 P(high | mid)	3 P(high | high)	Absolute Differences 4 = 3 - 1	5	6	7 = 3 - 2	8	9	Relative Differences 10 = 3 / 1	11	12	13 = 3 / 2	14	15
Low share of 4 years olds (mean - 1 SD = 0)	0.084 ** (0.042)	0.203 ** (0.096)	0.446 *** (0.151)	0.362 *** (0.111)	-0.011 (0.011)		0.244 *** (0.062)	-0.004 (0.007)		5.319 *** (1.59)	-0.747 * (0.384)		2.203 ** (0.519)	-0.063 (0.063)	
Avg. share of 4 years olds (mean)	0.098 ** (0.049)	0.210 ** (0.102)	0.450 *** (0.154)	0.352 *** (0.107)	-0.019 (0.016)	-0.030 (0.026)	0.240 *** (0.06)	-0.006 (0.01)	-0.010 (0.017)	4.572 *** (1.327)	-0.876 ** (0.411)	-1.623 ** (0.793)	2.139 ** (0.495)	-0.088 (0.088)	-0.151 (0.151)
High share of 4 years olds (mean + 1 SD)	0.123 * (0.065)	0.222 ** (0.112)	0.456 *** (0.16)	0.332 *** (0.1)			0.234 *** (0.059)			3.696 ** (1.081)			2.052 ** (0.472)		
B. Age at school entry															
Early school enrollment (mean - 1 SD)	0.115 (0.076)	0.229 ** (0.114)	0.464 *** (0.155)	0.349 *** (0.097)	-0.002 (0.01)		0.235 *** (0.053)	0.004 (0.01)		4.045 * (1.678)	0.304 (0.313)		2.026 ** (0.46)	0.107 * (0.065)	
Average school enrollment (mean)	0.104 (0.07)	0.211 ** (0.107)	0.451 *** (0.153)	0.347 *** (0.099)	-0.003 (0.01)	-0.006 (0.02)	0.239 *** (0.056)	0.003 (0.01)	0.007 (0.02)	4.349 * (1.776)	0.331 (0.367)	0.635 (0.68)	2.132 ** (0.486)	0.115 (0.074)	0.222 (0.138)
Late school enrollment (mean + 1 SD)	0.093 (0.065)	0.194 * (0.1)	0.437 *** (0.151)	0.344 *** (0.102)			0.242 *** (0.06)			4.680 * (1.94)			2.247 ** (0.521)		
C. Grade of school tracking															
Early tracking (mean - 1 SD)	0.125 (0.119)	0.227 * (0.139)	0.477 *** (0.169)	0.352 *** (0.093)	-0.021 (0.024)		0.250 *** (0.052)	-0.026 (0.017)		3.810 (1.916)	0.788 (0.67)		2.099 * (0.569)	0.024 (0.115)	
Average tracking (mean)	0.092 (0.097)	0.199 (0.126)	0.423 ** (0.166)	0.331 *** (0.1)	-0.028 (0.02)	-0.049 (0.044)	0.224 *** (0.057)	-0.028 * (0.015)	-0.054 * (0.032)	4.598 (2.379)	0.963 (0.914)	1.751 (1.581)	2.123 ** (0.547)	0.006 (0.127)	0.031 (0.241)
Late tracking (mean + 1 SD)	0.066 (0.076)	0.173 (0.114)	0.369 ** (0.161)	0.303 *** (0.108)			0.196 *** (0.063)			5.561 (3.087)			2.130 ** (0.547)		

Notes: see Table 4   Source: See Table 3.

Table A.7   Predictions of step 2 estimation - joint regression for three institutions - Romanic language region based on interacted model

A. Share of 4 years olds in Kindergarten	1 P(high | low)	2 P(high | mid)	3 P(high | high)	Absolute Differences						Relative Differences					
				4 = 3 - 1	5	6	7 = 3 - 2	8	9	10 = 3 / 1	11	12	13 = 3 / 2	14	15
Low share of 4 years olds (mean - 1 SD = 0)	0.140 (0.117)	0.291 * (0.166)	0.578 *** (0.173)	0.437 *** (0.086)	-0.026 ** (0.012)		0.287 *** (0.046)	-0.005 (0.006)		4.123 * (1.66)	-0.705 ** (0.33)		1.986 * (0.533)	-0.048 (0.061)	
Avg. share of 4 years olds (mean)	0.170 (0.121)	0.300 * (0.163)	0.582 *** (0.17)	0.412 *** (0.079)	-0.057 *** (0.017)	-0.082 *** (0.03)	0.282 *** (0.044)	-0.008 (0.009)	-0.013 (0.015)	3.418 * (1.356)	-0.897 ** (0.374)	-1.602 ** (0.704)	1.938 * (0.486)	-0.067 (0.081)	-0.115 (0.143)
High share of 4 years olds (mean + 1 SD)	0.234 * (0.127)	0.315 ** (0.16)	0.589 *** (0.166)	0.355 *** (0.069)			0.274 *** (0.042)			2.521 (1.017)			1.871 ** (0.428)		
B. Age at school entry															
Early school enrollment (mean - 1 SD)	0.183 (0.133)	0.324 ** (0.164)	0.599 *** (0.159)	0.416 *** (0.07)	0.002 (0.017)		0.275 *** (0.041)	0.007 (0.012)		3.272 (1.507)	0.244 (0.209)		1.847 * (0.46)	0.087 * (0.047)	
Average school enrollment (mean)	0.166 (0.125)	0.301 * (0.161)	0.583 *** (0.165)	0.417 *** (0.075)	0.010 (0.017)	0.012 (0.034)	0.282 *** (0.041)	0.006 (0.013)	0.013 (0.025)	3.517 (1.559)	0.539 ** (0.24)	0.783 * (0.449)	1.934 * (0.489)	0.094 * (0.052)	0.181 * (0.1)
Late school enrollment (mean + 1 SD)	0.140 (0.118)	0.280 * (0.157)	0.568 *** (0.171)	0.428 *** (0.083)			0.288 *** (0.045)			4.055 * (1.64)			2.028 ** (0.521)		
C. Grade of school tracking															
Early tracking (mean - 1 SD)	0.194 (0.157)	0.320 * (0.174)	0.606 *** (0.171)	0.411 *** (0.086)	-0.003 (0.036)		0.285 *** (0.048)	-0.013 (0.019)		3.115 (1.602)	0.635 (0.589)		1.890 * (0.534)	0.063 (0.083)	
Average tracking (mean)	0.148 (0.135)	0.285 * (0.168)	0.557 *** (0.177)	0.408 *** (0.092)	-0.013 (0.033)	-0.016 (0.069)	0.272 *** (0.05)	-0.017 (0.018)	-0.030 (0.037)	3.750 (2.004)	0.801 (0.864)	1.436 (1.448)	1.953 * (0.543)	0.058 (0.095)	0.121 (0.178)
Late tracking (mean + 1 SD)	0.111 (0.114)	0.252 (0.161)	0.507 *** (0.181)	0.396 *** (0.104)			0.255 *** (0.055)			4.551 (2.651)			2.011 * (0.561)		

Notes: see Table 4   Source: See Table 3.