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The Apple Falls Increasingly Far: Parent-Child Correlation in Schooling and the Growth of Post-Secondary Education in Switzerland

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Abstract

In this paper, we analyze the completed highest education degree of two birth cohorts (1934-1943 and 1964-1973) in Switzerland, using data from the 1999 wave of the Swiss Household Panel. As expected, the fraction of tertiary graduates has increased over time, for women more so than for men. Also, the educational attainment depends strongly on the educational attainment of parents. We then decompose the overall trend into a parental background effect, a general expansion effect and a distribution effect. For women in particular, we find that a substantial fraction of the overall increase in participation in tertiary education can be explained by the fact that the gap in participation rates between women with lowly educated parents and women with highly educated parents has narrowed. We then investigate the role of financial constraints in explaining these trends. Although the number of individuals suffering financial hardship during youth has declined over time, logit models show that financial problems have become more important as an impediment for higher education.

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1 Introduction

If one studies how patterns of education in the Swiss population evolved over the last half century or beyond, two observations stand out. First, there is a persistent general trend towards more formal education. For example, the proportion of people with just mandatory schooling decreased from 29.7 percent for those born in the 1940's (and thus educated in the 1940's and 1950's) to 17.7 percent for those born in the 1970's.[1] Secondly, women have caught up strongly. Comparing the proportion of university graduates in the two cohorts 1940-49 and 1960-69, there was a 2.2 percentage point increase for men but a 4.5 percentage point increase for women.[2] Indeed, in 2002, women were overrepresented among those completing the university entrance qualification (Matura), and at a rate of 47 percent only slightly underrepresented among those entering university (Vellacott and Wolter, 2004, p. 40). These developments are of course in no way unique to Switzerland. Qualitatively similar trends can be observed in many countries.

One can think of many potential explanations. Some are linked to labor market developments where skill biased technical change and globalisation have increased the skill premia in wages, and made the position of low skilled domestic workers increasingly precarious. Or education may simply be a normal (or even superior) good the demand for which increases with rising income levels. In either case, the government certainly has responded by increasing expenditures in the education sector substantially. Moreover, anti-discrimination legislation and changes in social norms and values have increased female participation above the general trend.

Against this general background, the specific goal of our paper is to investigate how parental education has interacted with the trend, i.e., how the intergenerational transmission in education levels has evolved over time. Clearly, at any point in time, it is well documented that parental

[1] Source: Swiss Census 2000; own calculations.

[2] The 2000 Census data underestimate the university graduation rate for 1970-79 cohort substantially, as the youngest cohort members were just 21 and could not have completed their education. In our own analysis, we compare the two cohorts 1934 to 1943 and 1964 to 1973.

education is a main explanatory factor of own education: the higher the education of the parent, the better – on average – the performance in school and the higher the education of the offspring.[3] Several issues surrounding this intergenerational transmission have been studied in detail, such as how institutional aspects of the school system might reinforce or weaken the transmission[4], or whether the observed association is due to genetic factors, or causally related to schooling per se.[5]

What is less common, however, is research into trends in intergenerational education mobility over time. For Switzerland, no such an analysis has, to the best of our knowledge, been undertaken so far, although it touches upon the central social policy concern of equity in education. Who has been affected most by the expansion of the upper-secondary and tertiary education sectors? Have some socio-economic strata benefited more than others? And if so, has the trend been one towards more or less equality in access and outcomes? These are questions of obvious interest for social and education policy.

One possible reason why the evolution of intergenerational education mobility in Switzerland over time has not yet been systematically studied may have to do with the scarcity of suitable data. Essentially, one needs survey information where direct parental background questions are included for each person, regardless of age. While the Census does not provide such information, a recent relatively large representative household survey - the Swiss Household Panel - does. We use for our empirical analysis the first wave collected in 1999, and concentrate on the comparison of two birth cohorts of individuals born between 1934 and 1943 as well as 1964 and 1973, capturing the trends in education over three decades.

[3]For Switzerland, see for example Bauer and Riphahn (2006a) and the references provided in Vellacott and Wolters (2004); international references include Cameron and Heckman (2001), Ermisch and Francesconi (2001), Dustmann (2004), and Woessmann (2004).

[4]See Schütz, Ursprung and Woessmann (2004) and Bauer and Riphahn (2006b) for studies showing that early tracking in school actually makes the link stronger.

[5]Recent contributions to this nature vs. nurture debate include Behrman and Rosenzweig (2002) and Antonovics and Goldberger (2005).

Formally, we proceed in two steps. First, we develop a framework in which the contrast in education participation between two birth cohorts can be decomposed into a parental background effect, a general expansion effect and a distribution effect. The parental background effect arises since even for constant intergenerational mobility rates (i.e., without any behavioral changes), an exogenous increase in parental education will lead to more educated children (because more educated parents tend to have more educated children), who in turn will have more educated children and so forth. As the analysis shows, the contribution of this effect to overall growth in education is very large for men, but relatively small for women. For women, most of the trend growth in higher education can be explained by increased transition rates. Since they increased most for the lower education backgrounds, the distribution effect is positive and we can indeed diagnose a trend towards increased mobility and equity.

The second step is then to extend the analysis to a multivariate framework, where we use logit models to single out the relative contributions of parental education, and the financial situation during childhood. What we find is that although the number of individuals suffering financial hardship during youth has declined over time, there is some evidence that financial problems have actually become more important as an impediment for higher education. The strong convergence in education by parental background persists once we control for financial problems, and is therefore likely related to factors outside of the financial domain.

2 Trends in Education in Switzerland

The trends we review in this section relate to the enrollment rates in the different schooling options over time. The education system *per-se* has stayed remarkably resilient over time, and it can, at a useful level of generality, be described as a four-part system: compulsory schooling only, upper secondary schooling, advanced vocational training and academic tertiary training.

Children start with primary school at the age of six or seven.[6] Primary school lasts for six years.

[6]Children typically can enter primary school in the fall of the year in which they complete their sixth birth year

It is followed by three years of lower secondary school ("Sekundarstufe I"). Primary school and lower secondary school together complete the compulsory education. After lower secondary school, at the age of 15 to 16, the pupils can either attend a full time vocational school, start an apprenticeship, both for periods of between two to four years, or they can continue their general education (mostly gymnasium) for three to four years. The majority chooses the apprenticeship system which prepares for a vocational career. The gymnasium prepares students to enroll at university. By the age of 18 or 19 a typical individual has finished either gymnasium or an apprenticeship. Further tertiary level education is offered by universities, the Federal Institute of Technology, universities of applied sciences and a variety of advanced vocational degree programs.

In the following we distinguish between two types of tertiary education, academic tertiary education or vocational tertiary training. Thus, we can distinguish in all generality between four levels of educational attainment, in an ascending order, as follows:

1 No completed compulsory school, completed compulsory school,
domestic science course, one year school of commerce

2 Upper secondary school: general training school, apprenticeship,
full time vocational school, gymnasium

3 Vocational tertiary level: advanced vocational degree programs

4 Academic tertiary level: universities and universities of applied science.

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Figure 1 about here

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Figures 1 and 2 show the population shares for these four schooling levels over time, i.e., for successive birth cohorts from 1900 up to 1975. The information comes from the Swiss Census of

by April 30. Here and elsewhere, there is some variation across the 26 cantons (or states) that make up Switzerland, since the education system is a cantonal responsibility. We refer to the predominant rules.

2000. We show the graphs separately for men and women, as there are important gender differences in schooling. Consider first the results for men in Figure 1. We find the aforementioned steady decline of persons with just compulsory education. The share of both types of tertiary education increases over time, university education in particular starting with the 1935 cohort (i.e., in the mid 1950's). On the other hand, the proportion of men with upper secondary education, the single largest category in all years, does not change much from the 1935 cohort onwards, hovering at a level of just under 50 percent. We also observe that at the end of the observation window, i.e., for those born in the early 1970s, there is a notable increase at the upper secondary level, coupled with a decrease at the tertiary level. The likely explanation is that not all men have completed their highest degree at the age of 25. This problem points to a general limitation of cohort studies of this type. Trends in education are only recorded with a relatively long time lag, and little can be said about the behavior of those who are currently making their education choices.

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Figure 2 about here

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Figure 2 shows the female population shares over time. The trends are qualitatively the same as those for men, only that they are much more accentuated. In a nutshell, the early cohort of women participated much less in advanced education programs than their contemporary men. By the end of the observation period, the female-male education gap had narrowed substantially, though not entirely disappeared. The proportion of women with just compulsory schooling decreased from above 70 percent to about 17 percent, only a couple of percentage points above the male rate. For women, academic and vocational tertiary education occur at the same rate, whereas more men attend vocational tertiary education programs than academic ones.

3 The data

Since the census data do not provide information on parental background and education – except for the relatively small subgroup of young persons still living at home that is studied by Bauer and Riphahn (2006a) – we have to base our investigation on an alternative data source. We use data from the first wave in 1999 of the Swiss Household Panel (SHP), an annual survey of a random sample of households in Switzerland. Since the SHP collects information not only about individuals' but also about parents' characteristics, it is possible to analyze trends using only a single cross-section – indeed, for our analysis there is no gain in using additional waves, as the same persons are re-interviewed whereas own and parental education is largely a time-invariant feature. About 7800 individuals living in 5000 households were interviewed in 1999.

Since the main focus is on the change of determinants of education, we compare two birth cohorts thirty years apart. In order to have enough observations, both cohorts cover a range of ten years each. The older cohort contains individuals born between 1934 and 1943. Due to the increasing mortality we do not want to include individuals born before 1934, and thus older than 65 in 1999. The second cohort comprises individuals born between 1964 and 1973. We are interested in the individual's highest educational attainment and we work on the assumption that most of the individuals who attain a tertiary education quite straightforwardly have finished their schooling at the age of 26. Observations with no information about own and both parents' education are dropped. The older birth cohort comprises 885 individuals and the younger cohort contains 1482 individuals. The average age in the two cohorts is 60 and 31 years respectively.

The original variable about individual's and parents' highest completed educational attainment in the SHP-data has eleven outcomes. These categories were recoded into the four categories mentioned in Section 2, in order to get a clear ordinal structure and to avoid outcomes with a small number of observations. An exception is the education of the mother, where we distinguish only between three educational outcomes. The two educational outcomes 3 and 4 are combined into a single outcome because the frequency of mother's high education is very low for the first cohort.

Unfortunately, the data do not contain information about the family income at the time of the individual's youth. But there is an item in the SHP questionnaire which refers to the financial situation of the family when the individual was 16 years of age. The question is: "During your youth, did your family encounter serious financial problems?" The variable *financial problems* is a dummy variable which is equal to one if the family encountered financial problems and zero if not.

We start the descriptive data analysis by affirming that the population trends found in the census data are similarly observed in our sample survey data. Table I shows the highest qualification by cohort. For women, the fraction of academic degrees with females has more than doubled from the first to the second cohort, from 7 to 17 percent, and for men we observe an increase from 24 to 28 percent. The fraction of the lowest educational attainment has decreased sharply by 21 percentage points (from 34 to 13 percent) for women and by 8 percentage points (from 13 to 5 percent) for men. The data provide thus clear evidence for convergence between females and males education outcomes.

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Table I about here

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Table II provides sample means for other variables used in the analysis, again stratified by cohort. First, we find that the educational levels of the parents show a pattern similar to those of the children. The fraction of less educated parents decreases while the fraction of highly educated parents increases when moving from the earlier cohort to the later cohort. Since parents in the earlier cohort are on average by 30 years older, this increase in education is just a reflection of the same trend that we also observe for children. The time scale is just moved one generation back.

While 40 percent of the individuals born between 1934 and 1943 indicate having grown up in a family with financial problems, this fraction decreased substantially over time. In the second cohort, the fraction of individuals who had financial problems in youth is only 13 percent. Table II includes two additional variables employed in the later analysis, *siblings*, a dummy variable which is

equal to one if the individual has siblings and zero otherwise, as well as a dummy variable for *living with both parents* at the age of 16. The variable *siblings* may be of interest if there is a quantity-quality tradeoff. The hypothesis is that with more siblings, the resources invested by parents in the education of each single child are diminished, making it less likely that higher education levels are attained, *ceteris paribus*. Similarly, not living with both parents may be an indicator of a disadvantaged childhood. Again, educational outcomes may be diminished as a result. We see from Table II, that both variables are virtually unchanged across the two cohorts. Thus, while these variables may explain variation in outcomes at given point in time, in the cross section, they will not be able to explain any trends in education.

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Table II about here

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4 The importance of parental background: first evidence

As we have seen in the previous section, there is a striking trend towards fewer people with low education only and more people with an academic degree. Now we come to the central question of this paper: how much does the own education depend on parental education, and how has this intergenerational transmission changed over time, if any. In other words, it is the question whether all social levels have benefited from the increase in higher education or whether this increase has occurred only for individuals with highly educated parents.

Parents' abilities and education influence the highest schooling level of their offspring through a number of different channels.[7] On one hand children inherit the genetically determined abilities of their parents which may result in similar school attainment. On the other hand more educated parents' may attach a higher importance to education and therefore invest more time and money

[7]For a review of the literature on the determinants of educational attainment see Haveman and Wolfe (1995).

in their children's education. In addition, they tend to have higher income and fewer children, both factors leading to higher available resources per child.

While we cannot really distinguish between the channels in our data, their combined effect is very clearly revealed in the first column of Table III. For simplicity, we focus from now on on a binary indicator of educational achievement, namely whether an academic degree was acquired or not. The Table shows the bivariate distribution between own academic degree and father's education. Taking the mother's education instead would produce qualitatively similar results, although the estimates for the highest education category would be very imprecise, as there are only few observations.

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Table III about here

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The first panel of Table III shows the results for females, the second panel those for males. We know from Table I, that only 7 percent of all women of the earlier 34-43 cohort had acquired a tertiary academic degree. We now see that this aggregate number hides an enormous disparity by parental background. For women with a "compulsory only" father, the estimated probability of an academic degree is 2.2 percent. For women with a "academic degree" father, the estimated probability of an academic degree rises to 46.4 percent. The difference in the estimated probability of an academic degree when moving from the lowest to the highest father's degree is thus a staggering 44.2 percentage points. Large differences are also observed for the later female cohort (a 34.8 percentage gap), and for men (47.9 and 36.6 percentage points, respectively).

Decomposing the trend growth in tertiary degrees

Given the large correlation between parental and own education, the long-term trends in education must at least to some degree be self-perpetuating: if more educated parents tend to have more educated children, then an exogenous increase in parental education will lead to more educated

children, who will tend to have more educated children, and so forth. We refer to this automatism as *parental background effect*. An alternative explanation for the increased participation in higher education is that transition rates have increased *per-se*.

Formally, we can decompose the probability of an academic degree $P_t(AC)$ at time t as follows:

$$P_t(AC) = \sum_{j=1}^{4} P_t(AC, FE_j) = \sum_{j=1}^{4} P_t(AC|FE_j)P_t(FE_j) \tag{1}$$

Thus, the probability at any point in time depends both on the conditional transition rates $P_t(AC|FE_j)$ as well as on the marginal distribution of the fathers' education $P_t(FE_j)$. Thus, the change in the proportion of individuals with academic degrees can be a consequence of a change in the distribution of the father's education $P_t(FE_j)$, or that of a change in the conditional distribution $P_t(AC|FE_j)$. Let the subscript $t-1$ refer to the cohort 1934-1943, and the subscript t refer to the cohort 1964-1973. We obtain the following decomposition of the between-cohort change:

$$\begin{aligned}
\Delta P(AC) &:= P_t(AC) - P_{t-1}(AC) \\
&= \sum_{j=1}^{4} P_t(AC|FE_j)P_t(FE_j) - \sum_{j=1}^{4} P_{t-1}(AC|FE_j)P_{t-1}(FE_j) \\
&= \sum_{j=1}^{4} \left(P_t(AC|FE_j) - P_{t-1}(AC|FE_j)\right) P_t(FE_j) - \\
&\qquad \sum_{j=1}^{4} \left(P_t(FE_j) - P_{t-1}(FE_j)\right) P_{t-1}(AC|FE_j) \\
&= \underbrace{\sum_{j=1}^{4} \Delta P(AC|PE_j)P_t(FE_j)}_{\lambda} + \underbrace{\sum_{j=1}^{4} \Delta P(FE)P_{t-1}(AC|FE_j)}_{\eta}
\end{aligned} \tag{2}$$

The term λ measures the educational expansion which is independent of parental education and contains on one hand information about the general trend in academic education, and on the other hand a shift in mobility. The second term η measures the effect of higher schooling which is due to a better starting position, i.e. an increase in parental education. $P_t(FE_j)$ and $P_{t-1}(AC|FE_j)$ respectively are the weights. Further, we may decompose λ as follows:

$$
\begin{aligned}
\lambda =& \sum_{j=1}^{4} \Delta P(AC|FE_j) P_t(FE_j) \\
=& \sum_{j=1}^{4} \left[\overline{\Delta P(AC|FE_j)} + \Delta P(AC|FE_j) - \overline{\Delta P(AC|FE_j)} \right] P_t(FE_j) \\
=& \overline{\Delta P(AC|FE_j)} + \sum_{j=1}^{4} \underbrace{\left(\Delta P(AC|FE_j) - \overline{\Delta P(AC|FE_j)} \right) P_t(FE_j)}_{\gamma_j}
\end{aligned} \tag{3}
$$

$\overline{\Delta P(AC|FE_j)} := \frac{1}{4} \sum_{j=1}^{4} \Delta P(AC|FE_j)$ measures the average increase of the conditional probabilities whereas the second term on the right hand side of equation (3) measures the sum of the weighted deviations of the increase of the conditional probabilities from the average increase. The second term would be equal to zero if the increase is equally distributed over all conditional probabilities and thus when there is no shift in mobility. However, the sign of $\sum_{j=1}^{4} \gamma_j$ does not tell us anything about increase or decrease in mobility. To say something about the change in intergenerational mobility, we have to look at each γ_j, $j = 1, \ldots, 4$, which measure the weighted deviations from the average increase. If γ_j is negative, the increase in subgroup j is less than the average increase and therefore the considered subgroup does not belong to the winners.

Applying this decomposition to the results in Table III, we find that the overall trend for females and males may be decomposed into the following three effects as derived from equations (2) and (3):

	$\Delta P(AC)$	=	$\overline{\Delta P(AC\|FE_j)}$	+	$\sum_{j=1}^{4} \gamma_j$	+	η
Females	9.80	=	3.81	+	$0.54 + 2.53 + 0.03 - 1.07$	+	3.96
Males	3.49	=	1.02	+	$0.83 - 1.52 + 0.63 - 1.23$	+	3.76

where η denotes the parental background effect, $\overline{\Delta P(AC|FE)}$ is called the general expansion effect and $\sum_{j=1}^{4} \gamma_j$ is the distribution effect. With females, the share of the general expansion effect and the parental background effect are both about 40 percent while the distribution effect explains about 20 percent of the increase. With males, the parental background effect explains more than 100 percent of the increase. This means that the sum of the general expansion effect and the

distribution effect is negative. This is due to the decrease in the second educational stratum which affects half of the population.

The results suggest that the general expansion was combined with strong convergence in the probability of an academic degree between children of less and highly educated parents. A likely explanation for the general expansion are linked to the labor market – the skill biased technological change has led to increased skill premia and, in general, to an increased awareness of the benefits of, and need for, higher education – that was matched by a policy response that increased the supply of education programs.

This by itself does not explain the overproportional increase in lower educational strata, especially among females. Part of it might be mechanical: if transition rates are already very high, as they approach the upper limit of one, growth is bound to be smaller than if transition rates are very low initially. Also, schooling institutions may have played a role in making education more equitable. There is an additional channel that we can analyze with our data, namely the role of financial constraints. The role of financial constraints may have diminished over time, as the rising income levels made education more affordable for parents of lower socio-economic background as well.

We know from the literature that children of financially constrained families have lower educational outcomes than children of richer families.[8] Since less educated parents tend to have a higher incidence of financial problems than highly educated parents – a correlation confirmed in our data – the reason for convergence may be due to a decreasing incidence (or importance) of financial problems. This channel will be tested in the next section using a multivariate logit analysis, where we also allow for separate effects of paternal and maternal education.

[8]See for example: Chevalier and Lanot (2002), Ermisch and Francesconi (2001), Jenkins and Schluter (2004).

5 A Logit model of tertiary education

We focus as before on the binary outcome variable *academic degree*. Let $y_i = 1$ if individual i has an academic degree, and $y_i = 0$ else. The logit binary choice model postulates

$$\begin{aligned} P(y_i = 1|\vec{x}_i) &= \Lambda(\vec{\beta}'\vec{x}_i) \\ P(y_i = 0|\vec{x}_i) &= 1 - \Lambda(\vec{\beta}'\vec{x}_i). \end{aligned} \tag{4}$$

where $\vec{\beta}$ is a vector of coefficients and $\vec{x}_i$ is a vector of parental and individual characteristics, and $\Lambda(c) = exp(c)/(1+exp(c))$. The parameters $\vec{\beta}$ can be estimated by maximum likelihood. Assuming a random sample of size n, the likelihood function is given by product of the individual likelihood contributions:

$$L(\vec{\beta}|y_i) = \prod_{i=1}^{n} \Lambda(\vec{\beta}'\vec{x}_i)^{y_i}[1 - \Lambda(\vec{\beta}'\vec{x}_i)]^{1-y_i} \tag{5}$$

After taking logarithms the log-likelihood function can be maximized numerically which produces a consistent, asymptotically normal and asymptotically efficient estimator.

Table IV shows the logit regression results separately by cohort and gender. Since the explanatory variables *father's* and *mother's education* are categorical, the estimated coefficients have to be interpreted relative to the omitted category, here the lowest educational outcome. Since the logit model is non-linear, the estimated coefficients cannot be directly interpreted as marginal effects. In the logit model, they estimate the change in the log-odds associated with a switch of the corresponding regressor from 0 to 1. This interpretation is somewhat unintuitive, and therefore we show also, in a separate table, the predicted probability changes. In either case, the sign of the coefficient unambiguously relates to the sign of the log-odds and probability change respectively.

Thus, focusing on coefficients that are statistically significant, we can conclude from Table IV that having a father with an academic degree, rather than a father with just compulsory schooling, has a positive ceteris paribus effect on the probability of an own academic degree for all groups. Interestingly, the effect of maternal education is even more important, in the sense that for mothers, already an upper secondary degree suffices to raise the child's probability of an academic degree relative to a mother without such a degree, whereas this effect is no significant for fathers.

The evidence on the financial problems variable is somewhat mixed. While the point estimates are negative in all four models, they are estimated with low precision. This was to be expected, as this self-reported measure is clearly only a very crude proxy for the true financial situation during childhood. Nevertheless, we find some evidence that for the 64-73 male cohort, having experienced financial problems during adolescence is associated with a reduction in the probability of an academic degree, as the p-value for a one sided test amounts to 5.2 percent.

Whereas single parenthood appears to be unrelated to educational attainment, some evidence for a quality-quantity trade-off can be found in the earlier cohort. For men, the negative effect of having grown up with siblings is statistically significant. The effect disappears in the later cohort, maybe a consequences of the decreasing family sizes, whereby the indicator variable "having grown up with at least one sibling" may not mean the same amount of rivalry in the two cohorts.

The predicted probabilities of an academic degree with different parental background are summarized in Table V. In order to estimate the predicted probabilities conditional on e.g. father's education, given all other explanatory variables and the maximum likelihood estimates $\hat{\vec{\beta}}$ of $\vec{\beta}$, we first replace the characteristics of $\vec{x}_i$ for each individual by the values of interest. Second, the probability for an academic degree is estimated for each individual given $\hat{\vec{\beta}}$ and the modified vector of characteristics. Third, the average of the individual's probability is calculated.

The change in the average predicted probabilities can be interpreted as the *ceteris paribus* effect of the associated regressor that was changed, because all other variables are kept constant at their actual sample values. For example, we find that the ceteris paribus effect for women of having a father with academic degree relative to having a father with compulsory education, on the probability of having an academic degree herself, is a 31 percentage point increase for the earlier cohort, and a 21 percentage point increase for the later cohort. These percentage point changes, while still being substantial, are smaller than those found in Table III with respect to paternal education (44 and 35 percentage points, respectively).

The simple explanation for the discrepancy is that the results in Table III do not control for maternal education and financial situation. But due to assortative matching, educated fathers tend

to be married to more educated women, i.e., educated mothers. Moreover, a higher education level reduces the incidence of financial problems during childhood. Thus, the unadjusted analysis gives us the combined effect of all these factors on own educational achievement, which will tend to be larger than the regression-adjusted results, that filters out the specific effect of paternal education.

Most importantly, though, we obtain from Table V clear evidence for convergence in *conditional* transition rates as well. In three out of four cases the gap $P_{jt}(AC|x \text{ high education}) - P_{jt}(AC|x \text{ low education})$, where $j = \{$ male, female $\}$ and $x = \{$ mother, father $\}$ has decreased over time, holding the other parent's education level and the financial situation constant. In other words, overall convergence has occurred in a manner unrelated to, and independent of, the financial situation. Indeed, the financial penalty has, if anything, increased over time, since for men at least, the effect has changed from practically "no effect" for the early cohort to a substantial gap for the second, more recent cohort. The probability of an academic degree conditional on financial problems is only 19 percent while the baseline probability of an academic degree is 28 percent.

6 Concluding Remarks

We have analyzed the trends in education, and its intergenerational transmission, in Switzerland. After a general overview, we have focused on the probability of obtaining a university degree for two birth cohorts (1934-1943 and 1964-1973), using data from the 1999 wave of the Swiss Household Panel. As methods, we used both a descriptive decomposition technique and a multivariate logit analysis, where we controlled for paternal education, maternal education, financial situation, siblings, and single parenthood.

The single most important determinant of the probability of an academic degree is the parental education. However, our main result is that the conditional transition rates have converged over time, i.e., that the influence of parental education, while still substantial, has decreased. The main driving force behind the convergence is an increased probability of obtaining a university degree for those individuals with less educated parents. Our decomposition analysis also revealed that

the trend growth in participation in tertiary education is at least partly mechanical, in the sense, that for each successive generation, as parental education levels increase, the child outcomes will increase as well even if the transition rates remain unchanged.

While Switzerland seems to be moving in the direction of more equal education outcomes - i.e. outcomes less dependent on parental background - certainly a desirable feature of the education system for many, some may deplore that the changes are too modest and slow. For such a judgment to be made in an informed way, one would like to know how much the observed trends depend on opportunities as opposed to choice, and also how much the remaining inequalities are based on innate abilities, if any. Unfortunately, with the type of data we have access to, we feel that we cannot carry the analysis further.

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A Figures

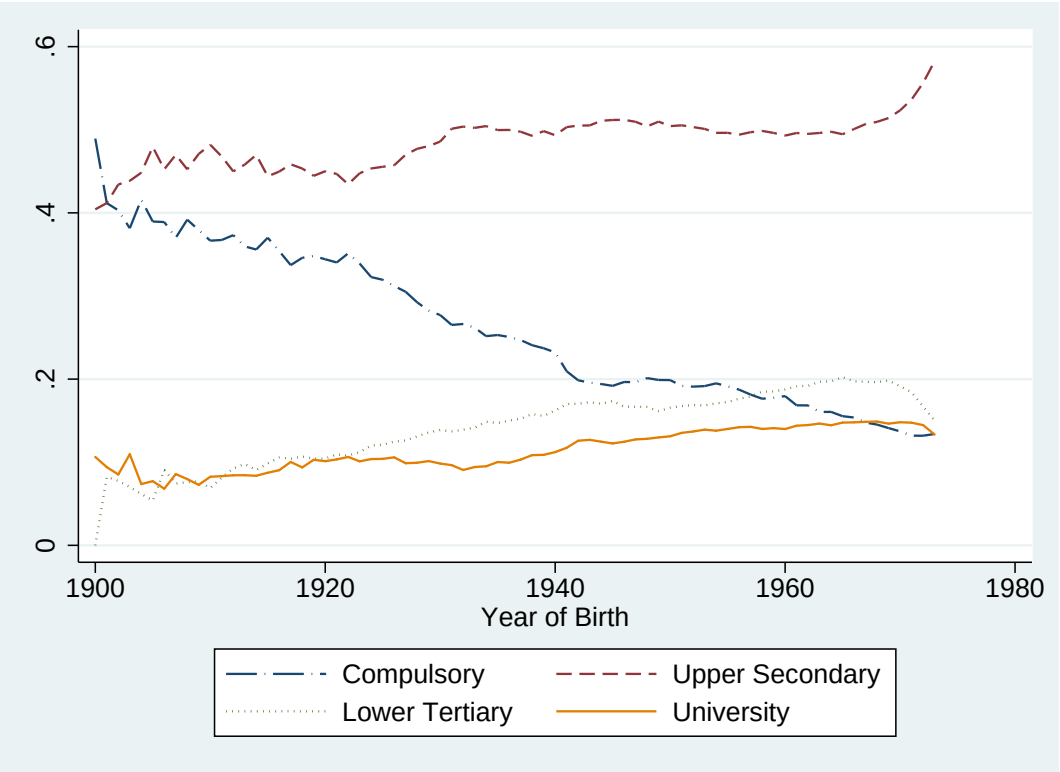

Figure 1: *Highest Education Level by Birth Cohort, Swiss Men. Source: Swiss Census 2000.*

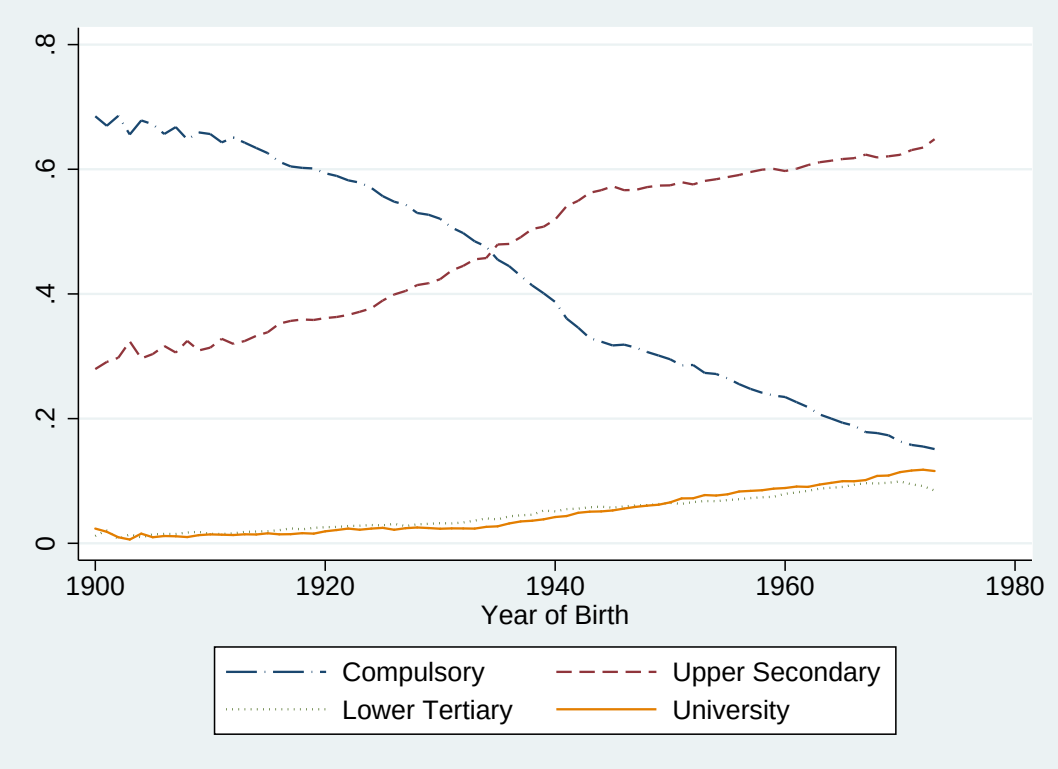

Figure 2: *Highest Education Level by Birth Cohort, Swiss Women. Source: Swiss Census 2000.*

B Tables

Table I: Distribution of education over the cohorts

Level of Education	Compulsory	Upper secondary	Advanced vocational	Academic degree
Females				
Cohort 1934-1943	0.34	0.56	0.04	0.07
Cohort 1964-1973	0.13	0.65	0.06	0.17
Males				
Cohort 1934-1943	0.13	0.49	0.14	0.24
Cohort 1964-1973	0.05	0.52	0.15	0.28

Table II: Sample means of the explanatory variables by cohort

	Cohort 1934-1943	Cohort 1964-1973
Mother: Compulsory school (1)	0.67	0.48
Mother: Upper secondary school (2)	0.31	0.47
Mother: Tertiary education (3 and 4)	0.02	0.05
Father: Compulsory school (1)	0.37	0.24
Father: Upper secondary school (2)	0.48	0.52
Father: Advanced vocational training (3)	0.08	0.08
Father: Academic degree (4)	0.08	0.15
Financial Problems	0.40	0.13
Siblings	0.86	0.87
Living with both parents	0.88	0.88

Table III: Probability of an academic degree by father's education

Females							
	$P_{t-1}(AC\|FE_j)$	$P_t(AC\|FE_j)$	Δ	γ_j	$P_{t-1}(FE_j)$	$P_t(FE_j)$	Δ
j=1	2.17	8.10	5.93	0.54	37.94	25.64	-12.30
j=2	4.66	13.32	8.66	2.53	48.66	52.26	3.60
j=3	13.51	17.74	4.23	0.03	7.63	7.57	-0.06
j=4	46.43	42.86	-3.57	-1.07	5.77	14.53	8.76
$\overline{\Delta P(AC\|FE_j)}$			3.81				
Males							
	$P_{t-1}(AC\|FE_j)$	$P_t(AC\|FE_j)$	Δ	γ_j	$P_{t-1}(FE_j)$	$P_t(FE_j)$	Δ
j=1	10.64	15.33	4.69	0.83	35.25	22.62	-12.63
j=2	28.19	26.30	-1.89	-1.52	47.00	52.19	5.19
j=3	16.67	24.59	7.92	0.63	7.50	9.20	1.70
j=4	58.54	51.89	-6.65	-1.23	10.25	15.99	5.74
$\overline{\Delta P(AC\|FE_j)}$			1.02				

t-1: Cohort 1934-1943, t: Cohort 1964-1973

$\gamma_j = \left(\Delta P(AC|FE_j) - \overline{\Delta P(AC|FE)}\right) P_t(FE_j)$

Table IV: Logit results for probability of academic degree

	Females		**Males**	
	1934-1943	1964-1973	1934-1943	1964-1973
father2	0.301	0.267	0.662^{+}	0.358
	(0.612)	(0.312)	(0.341)	(0.279)
father3	1.544*	0.281	-0.093	0.124
	(0.671)	(0.471)	(0.622)	(0.403)
father4	2.980**	1.394**	1.708**	1.303**
	(0.665)	(0.382)	(0.486)	(0.342)
mother2	0.943*	0.625*	1.176**	0.611**
	(0.459)	(0.256)	(0.290)	(0.212)
mother3	1.922*	1.871**	1.444*	0.873^{+}
	(0.896)	(0.447)	(0.707)	(0.448)
financial problems	-0.400	-0.297	-0.234	-0.587
	(0.463)	(0.329)	(0.282)	(0.361)
live with both p.	-0.218	0.492	0.078	-0.048
	(0.660)	(0.346)	(0.387)	(0.289)
siblings	-0.852	0.257	-0.737*	-0.073
	(0.563)	(0.339)	(0.318)	(0.263)
Log likelihood	-91.1	-323.8	-190.0	-364.0
$\chi 2$	52.1	81.4	54.6	53.4
Observations	485	819	400	663

Notes: Robust Standard errors in parentheses

Significance levels: + 10%, * 5%, ** 1%

Table V: Predicted probabilities of an academic degree by parental background

	Females		Males	
	1934-1943	1964-1973	1934-1943	1964-1973
Baseline probability $P_t(AC)$	0.07	0.17	0.24	0.28
$P(AC$|father1)	0.03	0.11	0.16	0.20
	(0.015)	(0.027)	(0.039)	(0.038)
$P(AC$|father4)	0.34	0.32	0.47	0.47
	(0.087)	(0.054)	(0.088)	(0.050)
Difference	*0.31*	*0.21*	*0.31*	*0.27*
	(0.088)	*(0.061)*	*(0.093)*	*(0.062)*
$P(AC$|mother1)	0.04	0.11	0.17	0.21
	(0.013)	(0.017)	(0.025)	(0.024)
$P(AC$|mother3/4)	0.18	0.42	0.44	0.38
	(0.119)	(0.094)	(0.137)	(0.094)
Difference	*0.14*	*0.31*	*0.27*	*0.17*
	(0.121)	*(0.097)*	*(0.137)*	*(0.093)*
$P(AC$|no financial probl.)	0.07	0.17	0.26	0.29
	(0.014)	(0.016)	(0.027)	(0.019)
$P(AC$|financial probl.)	0.06	0.14	0.22	0.19
	(0.017)	(0.033)	(0.035)	(0.049)
Difference	*-0.01*	*-0.03*	*-0.04*	*-0.10*
	(0.024)	*(0.037)*	*(0.046)*	*(0.055)*

Notes: Standard errors in parentheses are computed using the bootstrap method

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