Intergenerational Transmission of Educational Attainment in Austria *

Pirmin Fessler† Martin Schuerz‡

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Abstract

The Austrian Household Survey on Housing Wealth shows strong persistence in educational attainment. The size of educational persistence varies over time in Austria. Using a Markovian approach and uni- as well as multivariate econometric techniques we show that educational mobility increased over time. In general our results question the existence of meritocratic values and equal opportunity for educational advancement in the Austrian society. Intergenerational transmission of disadvantages in education matters for policies.

VERY PRELIMINARY / DO NOT CITE

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†e-mail: pirmin.fessler@oenb.at

‡e-mail: martin.schuerz@oenb.at

1 Introduction

In this paper we try to examine the stylised fact that descendants of parents with higher education are also better off in terms of education than descendants of parents with lower education. The Austrian education system is mainly public. However, the division between "Hauptschule" and "Allgemeine Hoehere Schule" at the age of 10 might imply a low level of educational mobility.

We test the following questions (i) Is there persistence in educational outcomes, i.e. is the education of parents and descendants positively correlated? (ii) Is persistence relatively strong in comparison to other European countries? (iii) Does the dependence varies over time? (iv) Is gender relevant for the educational outcome?

We use a Markovian approach, univariate and multivariate econometric approaches,. The variety of methods allows us to check the robustness of our results. Due to the absence of long panel data series for Austria we use the Household Survey on Housing Wealth (HSHW), a cross sectional survey, which incorporates information on the descendants education as well as information on the educational level of their parents.

Advantages and disadvantages are passed from one generation to the next. A society that is characterised by a high degree of transmission of social status may have problems in claiming meritocratic ideals at the same time.

There are numerous factors that shape intergenerational mobility:

Household income: Income poverty is related to bad health conditions and a low level of nutrition and housing. This lowers the future life-chances of children. Low income persistence is especially harmful as it cumulates with other forms of disadvantages. On the opposite access to social networks will be helpful for children of high-income households. Children in these households may also profit from a transmission of verbal skills and non-cognitive abilities.

Household wealth is important as parents that are wealth constrained cannot invest as much in the education of their children as rich parents. Borrowing against future earnings is difficult and liquidity constraints will affect investment in human capital (Becker and Tomes (1979)). Wealthy parents pass gifts and bequests over to their children. These wealth transfers increase the asset holdings of children and will deteriorate the principle of equal opportunity

Educational attainment is significantly correlated across generations. Education traits persist between generations in all OECD countries and the OECDF claims that parental education is by far the most important background characteristic (see OECD 2008, p. 216). Belzil and Hansen (2003) argue that household background variables (in particular parents education) account for 68% of the explained cross sectional variations in schooling.

Genetic factors might also matter. Children may inherit genetically based behavioural characteristics. However, their contribution is rather unclear. Bowles et al. 2005 find that little intergenerational inequality is due to parents passing superior IQ on to their children

Many of those factors are interwoven in the process of intergeneration transmission of inequality. Wealth, income, social environment, genetics, household structures and others will be of relevance. A thorough assessment would require a survey containing data on all kinds of individual and social characteristics of parents and children. The Austrian household survey does not include that extensive information. However, we know about parent's education and this is - as shown in numerous studies is a good indicator for intergenerational inequality.

The paper is organized as follows: In section 2 we review the literature on the inheritance of social status including the literature on the transmission of educational attainment. Section 3 provides empirical evidence in a descriptive way in subsection 3.1, using the Markovian approach in subsection 3.2 and using econometric techniques, namely a univariate Ordinary Least Squares and a multivariate Ordered Logit Model, in subsection 3.3. Section 4 concludes.

2 Literature Overview and Theoretical Reasoning

The Theoretical Background of most empirical models on intergenerational transmission is the Becker-Tomes (1979,1986) model, which is itself related to Galton 1877 (Mulligan, 1999). Both are heavily discussed in the literature on intergenerational transmissions and transfers (Bowles and Gintis, 2001). Intergenerational correlation of income, wealth, consumption and education is well documented in a huge number of empirical studies (Mulligan 1999, Table 1).

The reasons for this correlation may of course be multidimensional. In the literature most prominently genetic transmission, parental care, parental abilities, parental role model, parental income, parental wealth, pre-school facilities, school facilities and out of school environment are considered to be of importance. The main question is the "Nature versus Nurture" question, i.e. wether the high correlation between parents and descendants education is mainly due to the genetic transmission of ability or to the social environment of the descendants (parental care, income, education, and so on). No consensus exists on this question but most researchers agree that the answer lies mainly in social environment and given a certain environment (e.g. educational system) especially in the resources of the parents. A review of the literature at hand concludes that parents' education is the most important factor explaining educational attainment of children (Haveman and Wolfe, 1995, Checci et al., 2008).The main problem is that there are hardly any datasets available which could cover even just few of these variables together with the outcome variables and control variables (mainly abilities) concerning the descendants.

3 Empirical Evidence

3.1 Data

To analyze intergenerational transmission processes one needs to rely on data incorporating information on at least two generations, mostly one descendant and her parents. For Austria there are few datasets containing this information for a representative sample of descendants. The dataset we use is the HSHW 2008[1], which incorporates questions on the educational level of the interviewee, which is in our case the owner or tenant of a main residence of an austrian household. Furthermore the interviewee is asked to state the educational level of her mother and father. The survey asked for six different school levels[2] which we aggregated into 4 classes[3]. Ta-

[1]This preliminary work is still using a beta-version of the dataset, minor changes could still be possible but shouldn't change any results significantly

[2]1. no degree ; 2. Compulsory school level ; 3. apprenticeship or vocational school degree; 4. medium-level or technical school; 5. Matura and higher level vocational school; 6. University, Fachhochschule

[3]The classification is basically maximum primary, secondary and high education, but splitting up the medium education into two parts: one is the original class 3 (taking 10 or less statuory school years to finish and is more manual labor oriented). The other is the aggregated original classes 4 and 5 (taking 11 and more statuory school years to finish and are in general not manual labor oriented). For a detailed discussion of the Austrian Educational System in an economical context see Fersterer 2001.

ble 1 shows the educational distributions of the resulting populations (descendants, fathers, mothers).

	descendants			fathers			mothers		
	n	%	c.%*	n	%	c.%	n	%	c.%
max compulsory school	356	17	17	746	37	37	1,126	55	55
apprenticeship; vocational school	879	42	59	833	41	78	570	28	83
Matura; medium technical school	633	30	89	341	17	95	310	15	98
university; Fachhochschule	215	11	100	113	5	100	40	2	100
Total	2,083	100		2,033[1]	100		2,046[2]	100	

Source: Author's calculations on HSHW 2008

* c.% denotes cumulative percent

[1] For 50 observations in the dataset educational levels for fathers are mssing

[2] For 37 observations in the dataset educational levels for mothers are mssing

Table 1: Distributions of Educational Levels for descendants', fathers' and mothers' populations

The descendant population is in general higher educated than the fathers and mothers population. Furthermore fathers are generally higher educated than mothers (table 1). Table 2 shows the distributions for female and male descendants. In general the male population is higher educated than the female population. But in contrast to the mothers' versus fathers' distribution in table 1 the educational gender differences seem to be reduced substantially in the descendant population. The mothers' population is the only one with mode max. compulsory education, whereas the apprenticeship and vocational school class is the mode for all the other distributions. To gain further evidence on intergenerational transmission the next step is to look at joint distributions of parental and descendant populations. One well established approach to do so is the Markovian approach[4].

3.2 Markovian Approach

In this section we calculate right stochastic matrices for the transitions of the Markov process describing the intergenerational educational transmission.
Let $\mathcal{E}$ be a finite state space, where $e_i \in \mathcal{E}$ are the states and e is the number of states. Let $P = [p_{ij}] \in \mathbb{R}_+^{e \times e}$ be a stochastic matrix where the probability of moving

[4]For Markovian approach theory relevant to intergenerational transmissions/transfers see e.g. Shorrocks 1978, Geweke 1986 and Van de Gaer 2001. See Norris 1997 for Theory on Markov Chains

	descendant=male			descendant=female		
	n	%	c.%*	n	%	c.%*
max compulsory school	137	14	14	219	20	20
apprenticeship; vocational school	453	46	60	426	39	59
Matura; medium school	273	28	88	360	32	91
university; Fachhochschule	119	12	100	96	9	100
Total	982	100		1,101	100	

Source: Author's calculations on HSHW 2008

* c.% denotes cumulative percent

Table 2: Distributions of Educational Levels for descendants by male and female descendants

from state e_i to state e_j is defined as $Pr(j|i) = p_{ij} \geq 0$ which is given by the element in row i and column j of the matrix P. Of course $\sum_{j=1}^{e} p_{ij} = 1$, which means that every origin state leads to some final state with probability 1.

In our case the states e_i are given by the set of different educational levels. E^f denotes the row vector which gives the marginal distribution of the education levels of the fathers, E^d denotes the vector which gives the marginal distribution of the education levels of the descendants. Therefore, a row vector $p_{i1}, p_{i2}, \ldots, p_{ie}$ is the educational "lottery" faced by a descendant whose father belongs to educational class i.

Example. To illustrate the intuition for this approach let us suppose a simple example, where we have a population of six fathers and six descendants. Education levels are just low or high. Three fathers have low education, three fathers have high education. Three descendants have low education, three descendants have high education. Let us assume that one descendant has higher education than her father and one descendant has lower education than her father. The transition propability is given by $Pr(j|i) = p_{ij} = w_{ij} \sum_{j=1}^{e} w_{ij}$, where w_{ij} is the sum of the weights for fater-descendant pairs associated with educational transition from educational class i to class j for $i, j = 1, 2, \ldots, e$. The associated transition matrix P is therefore given by

$$P = \begin{bmatrix} p_{1,1} & p_{1,2} \\ p_{2,1} & p_{2,2} \end{bmatrix} = \begin{bmatrix} 2/3 & 1/3 \\ 1/3 & 2/3 \end{bmatrix}$$

which gives the transition from the educational distribution of the fathers population to the educational distribution of the descendant population, in this case

$$\underbrace{\begin{bmatrix}3 & 3\end{bmatrix}}_{E^f} \times \underbrace{\begin{bmatrix}2/3 & 1/3\\ 1/3 & 2/3\end{bmatrix}}_{P} = \underbrace{\begin{bmatrix}3\\ 3\end{bmatrix}}_{E^d}$$

We use HSHW 2008 data to construct vectors of educational distributions. The vectors E^f and E^d and therefore the corresponding transition matrix (by rows and columns) $P^{f\to d}$ are ordered from high (e_1) to low education level (e_4) [5]. The offspring population is given by the interviewees, which are also asked about their parents highest education. The transition matrix for the educational transmission from fathers to descendants is given by $P^{f\to d}$, which is based on 1906 observations in the total sample of 2083 (129 descendants aged 24 and less are set to missing, 50 missings for fathers education, for two of the cases both is true).

$$P^{f\to d} = \begin{bmatrix}0.51 & 0.43 & 0.06 & 0.00\\ 0.23 & 0.55 & 0.19 & 0.03\\ 0.08 & 0.30 & 0.57 & 0.05\\ 0.04 & 0.17 & 0.42 & 0.37\end{bmatrix}$$

The transition matrix $P^{f\to d}$ shows that e.g. for a descendant of a father with the highest education level ($e_1 = university$) degree the probability of holding an university degree is 0.51 and to hold at least a level e_2 degree 0.94, while for a descendant of a father with maximum compulsary education the same probabilities are 0.04 and 0.21 respectively. Generally we would guess that a descendant of a father with a higher educational attainment will be facing a somehow "better" lottery than a descendant of a father with a lower educational attainment.

A possibility to order the lotteries which two given descendants are facing given their fathers education is the stochastic dominance ordering. Let p_i denote the row vector of the ith row of a right stochastic transition matrix P. Lets assume a "at least as good as" preference relation $\succeq$. In the sense of stochastic dominance the lottery p_i is "as least as good" as lottery p_j if $p_{i,1}+p_{i,2}+\cdots+p_{i,m} \geq p_{j,1}+p_{j,2}+\cdots+p_{j,m}\ \forall\ m = 1,2,\cdots,e-1$ and "better" ($\succ$) if at least one ineqality holds. In the case of $P^{f\to d}$ that means that $p_1 \succ p_2 \succ p_3 \succ p_4$. Therefore the transition matrix is said to be monotone because $\forall\ i = 1,2,\cdots,e-1,\ \sum_{j=1}^{k} p_{i,j} \geq \sum_{j=1}^{k} p_{i+1,j},\ k = 1,2,\cdots,e-1$. In other words: Let us suppose that two descendants from the children population

[5] $e_i = \{e_1, e_2, \ldots, e_4\}$, where $e_1 = university,\ Fachhochschule$, $e_2 = Matura\ and\ Medium-level\ technical\ and\ vocational\ school$, $e_3 = apprenticeship,\ vocational\ school$, $e_4 = max\ compulsory\ school$

with different education levels of fathers are chosen. Then the following statement is always true: The one with the higher educated father faces a "better" lottery in the stochastic dominance sense.
To investigate the transmission of educational attainment further, we calculate the following transition matrices, of wich all turned out to be monotone:

- $P^{f \to d_f}$ and $P^{f \to d_m}$, where $d_f e$ and $d_m a$ are the female respectively male subsets of the set of the descendants population.
- $P^{f \to d_{<1960}}$, $P^{f \to d_{1960-1980}}$, $P^{f \to d_{>1980}}$, where d_{x_i} with $x_i = \{< 1960, 1960 - 1980, > 1980\}$ denote subsets of the offspring population according to there starting of primary school.

Mobility Measures Shorrocks (1978) provides a general framework to measure mobility when the data are provided in the form of a transition matrix. In general those measures can be defined as continous real funtcions of the form $M(\cdot) : P \mapsto \mathbb{R}$ over the set of transition matrices $\mathcal{P}$.
Generally, there are two ways of analyzing mobility. Mobility as *movement* and mobility as *independence*. If mobility is defined as movement, a measure of mobility should prefer mobility matrices which incorporate more movement to those which incorporate less movement. If mobility is defined as independence, a mobility measure should prefer those mobility matrices which incorporate less unequal lotteries to those which incorporate more unequal lotteries. In this sense independence can also be interpreted as "equality of opportunity".
In order to follow an independence approach, which means that the highest mobility is achieved if a matrix induces perfect origin independence it's convenient that for a measure of mobility it holds that $M(I) \leq M(P) \leq M(\bar{P})$, where $I \in \mathcal{P}$ is the identity matrix and $P \in \mathcal{P}$ is any transition matrix and $\bar{P} \in \mathcal{P}$ is any transition matrix all rows of which are identical. The identity matrix generates no transition between states and should be assigned by the index with the least level of mobility while the matrix $\bar{P} \in \mathcal{P}$ should be assigned with the highest level of mobility, because it induces perfect origin independence (Fields and Ok, 1996, Prais, 1955). Of course this property is not always desirable especially if mobility is defined as movement. However, it is for an intergenerational framework where it makes sense to concentrate on mobility as independence. Furthermore for convienience the measures are normalized to the intervall $[0, 1]$. The axioms introduced by Shorrocks (1978) are inconsistent on the full domain of $\mathcal{P}$[6]. Therefore, the standard measures are not

[6] The relevant axioms are
(i) *Monotonicity*: $P \succ P'$ when $p_{ij} \geq p'_{ij} \forall i \neq j$ and $p_{ij} > p'_{ij}$ for some $i \neq j$. Therefore

appropriate to measure mobility defined as independence on the full domain of $\mathcal{P}$ as is shown by van de Gaer et al. 2001. For our empirical analyzes of transition matrices this is not problematic because we can restrict the set to $\Xi \subset \mathcal{P}$, the set of monotone transition matrices (Fields and Ok, 1996, van de Gaer et al., 2001).

A widely used measure of this family of indices is the Second Eigenvalue Index. The eigenvalues of a given transition matrix ordered by the absolute value of their real part are given by $\lambda_i = |\lambda_1| \geq |\lambda_2| \geq \ldots, \geq |\lambda_n|$. For every transition matrix $\lambda_1 = 1$. The Eigenvalue Index measures the distance of any given transition matrix to the origin independent matrix $\bar{P}$ and is given by $M^{SE}(P) \equiv 1 - |\lambda_2|$. If λ_2 equals to zero the transition matrix equals to the limiting origin independent matrix. Therefore Ml equals 1 when the outcome distribution is independent of the original distribution. If Ml equals 0 on the other hand the educational attainment of the descendant population (E^d) is perfectly determined by the educational attainment of the fathers population (E^f). As a second measure of this family we use the measure proposed by Shorroks (1978)[7]. Based on the trace of the transition matrix the index evaluates the concentration arround the diagonal of the matrix, $M^S(P) \equiv \frac{e-trace\ P}{e-1}$. As third index which is bounded between 0 and 1 we use the Determinant Index given as $M^D(P) \equiv 1-|det(P)|^{1/n-1}$. The determinant index is related to the average magnitude of the moduli of the eigenvalues of P.

All of the above indices give no indication about the number of classes an average descendant is away from the educational class of his father. The so called absolute average jump $AAJ(P)$ gives the mean number of classes moved in absolute value. Therefore in our case $AAJ(P) \in [0, 3]$.

One more possibilty to summarize the information of a transition matrix, which is based on rank order correlation, is Kendall's tau-b ($Ktau - b(P)$)which lies in the intervall $[-1, +1]$, where a value of zero would be independence and values of -1 and $+1$ perfect negative respectively positive dependence. Table 3 shows all selected mobility indices for all described transition matrices.

Besides the Determinant Index all of the indices lead to the same ranking implying increasing mobility over time, i.e. $P^{f \to d_{>1980}}$ inorporates more mobility than $P^{f \to d_{1960-1979}}$ and $P^{f \to d_{1960-1979}}$ icorporates more mobility than $P^{f \to d_{<1960}}$. Concerning the gender issue it seems to be unclear if the educational outcome of male or

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$M(P) > M(P')$.

(ii) *Immobility*: $M(I) = 0$. Minimum should be reached for identity matrix.

(iii) *Perfect Mobility*: Let $P'' = (1/n)uu'$ where u is an n-dimensional vector of ones. Then $\forall P \neq P'' \in \mathcal{P}$ it follows that $M(P'') > M(P)$

Clearly (i) and (iii) are inconsistent on the domain of $\mathcal{P}$

[7] Sometimes also refered to as Shorroks Mean exit Time or Prais Index.

	$M^{SE}(P)$	$M^{S}(P)$	$M^{D}(P)$	$AAJ(P)$	$Ktau-b(P)$
$P^{f\rightarrow d_{>1980}}$	0.543	0.732	0.765	0.677	0.390
$P^{f\rightarrow d_{1960-1979}}$	0.427	0.656	0.689	0.599	0.447
$P^{f\rightarrow d_{<1960}}$	0.344	0.642	0.851	0.543	0.516
$P^{f\rightarrow d}$	0.469	0.666	0.700	0.602	0.468
$P^{f\rightarrow d_{ma}}$	0.459	0.649	0.671	0.600	0.469
$P^{f\rightarrow d_{fe}}$	0.460	0.677	0.723	0.600	0.471

Table 3: Mobility Indices of selected transition matrices of educational transmission

female descendants are more dependent on fathers education. According to the Shorrocks-Type Indices females seem to be less dependent whereas Kendall's tau-b is lower for males than for females. All in all the differences are quite small.

3.3 Econometric Evidence

Most studies dealing with the intergenerational transmission of education concentrate on the correlation between parents and descendants educational attainment. Mostly the data do not include good measures of social environment, parental care or wealth. Therefore most studies have to assume that at least partially educational achievement includes also the other aspects. The general functional form of the following estimations will therefore be $E_i^d = E_i^d(E_i^f, E_i^m, C_i^d)$ for $i = 1, 2, \cdots, N$, where E_i^d, E_i^f, E_i^m describes the individual educational attainment of individuals from the descendant's and her fathers or mothers education respectively and C_i^d are additional characteristics of an individual belonging to the descendant population.

Univariate Analysis - OLS and Correlation In order to be able to make comparisons with other countries we use univariate methods, which have been heavily used to analyze intergenerational transmission of educational attainment for a large number of countries (Chevalier et al., 2003). Following the approach by Checchi et. al (2008)we estimate OLS regressions of the form,

$$E_i^d = \alpha + \beta E_i^p + \varepsilon_i \text{ for } i = 1, 2, \cdots, N, \quad (1)$$

where $p = f$ in the first estimation and $p = m$ in the second estimation. ε_i is an normally distributed error term with zero mean and σ^2 variance. The according OLS estimate for each regression is

$$\hat{\beta} = \frac{\sigma_{dp}}{\sigma_p^2} = \rho_{op}\frac{\sigma_d}{\sigma_p},$$

with $\sigma_d, \sigma_f, \sigma_m$ being the standard deviations of education of the according populations and ρ_{dp} beeing the correlation coefficient between descendants and fathers ($p = f$) or mothers ($p = f$) education. An decreasing $\hat{\beta}$ over time can be interpreted as more independence concerning educational outcomes. To ensure that a possible decrease or increase is not only due to an evolution of the distributions of the educational attainments, namely the term $\frac{\sigma_d}{\sigma_p}$ one can normalise the individual educational attainment variables by the corresponding standard deviations which is an intuitive interpretation of correlation, and leads to

$$\frac{E_i^d}{\sigma_d} = \alpha + \gamma\frac{E_i^p}{\sigma_p} + \varepsilon_i \text{ for } i = 1, 2, \cdots, N \qquad (2)$$

where the evolution of γ over the separately estimated subsets of the descendant population according to there starting of primary school ($< 1960, 1960 - 1980, > 1980$) can be interpreted as evolution of the correlation between parents and descendants. Table 4 shows the estimation results of Model 1 and 2 with (i) fathers as independent ($p = f$) and (ii) mothers as independent variable ($p = m$). Note that for this exercise we have to transfer the categorical variables into statuory schooling years, i.e. the years which are at least necessary to complete a certain educational degree[8]. Furthermore as our data does not allow for instrumental variable estimation the interpretation of the level of the estimates may be biased due to the lack of controls for parental care, parental ability, social environment and so on. The literature shows that IV-estimates tend to be lower, which is due to the generally positive correlation with parental education. The interpretation of the changes over time is valid under the assumption that the influence of the possible biasing factors are time invariant. The coefficients in all estimations are clearly lower for the younger descendant subset (starting primary school > 1980) than for the subset with the oldest descendants (starting primary school < 1960). The dependence of the educational outcome of the descendants from their parents decreased over time. The fact that we find higher β coefficents for the fathers regressions than for the mothers' regressions but the other way round for the γ coefficents shows that a large part of β coefficient is due to dif-

[8]In doing so we use all the categorical information available and replace them with appropriate statuory schooling years: max. compulsory school=9, apprenticeship and vocational school=10, medium technical school=11, Matura and higher vocational school=12.5, University and Fachhochschule=16. Due to the complex educational system it is not unambigously clear which would be the right statuory values but for the set of reasonable values results are pretty robust.

	Model 1		Model 2	
	$\hat{\beta}_{father}$	$\hat{\beta}_{mother}$	$\hat{\gamma}_{father}$	$\hat{\gamma}_{mother}$
> 1980	0.542***	0.576***	0.455***	0.381***
	(0.038)	(0.052)	(0.033)	(0.034)
R^2	0.21	0.14	0.21	0.14
$1960 - 1980$	0.640***	0.822***	0.525***	0.454***
	(0.037)	(0.057)	(0.030)	(0.032)
R^2	0.27	0.20	0.27	0.20
< 1960	0.674***	0.744***	0.588***	0.464***
	(0.048)	(0.074)	(0.043)	(0.047)
R^2	0.35	0.21	0.35	0.21

Source: authors calculations on HSHW 2008 data.
Notes: *,**,*** denotes significance at 10%, 5%, 1% level
Standard errors are given in parenthesis.

Table 4: Estimation Results for Models 1 and 2 with fathers or mothers as independent variable

ferences in the distributions. The starting level of the standard deviations is clearly lower for the mothers' population than for the fathers' population. The standard deviation of all populations (mothers, fathers and descendants) is rising over time. The one of the mothers' population stays lower in all three subsets but is rising faster (The change from the subset < 1960 to the subset > 1980 is 19% for mothers and 9% for fathers) which explains the evolution of the differences between the β and γ coefficients. All in all fathers' as well as mothers' education correlate significantly with descendants' education. The correlation generally decreased over time with the exception of the β coefficient for the mothers distribution, which increased slightly from the subset < 1960 to the subset $1960 - 1980$ and than decreased sharply to the subest > 1980. But also this slight increase was due to distributional issues as one can see at the corresponding evolution of the corresponding γ coefficient. Disregarding distributional differences of the population and their changes over time the correlation between fathers and descendants is higher than between mothers and descendants. Concerning trend and magnitude of the evolution of the coeficcients our results are in line with the results of Checchi et al. (2008) for Italy.
Compared to measures estimated[9] by Hertz et al. (2008) our results seem to be quite reasonable. Their estimated β coefficients for Italy is 0.67, 0.58 for Sweden

[9]for their estimation Hertz et al. used the average of the schooling years of fathers and mothers

and the Netherlands,0.54 for Slovenia, 0.48 for Finland and 0.46 for the USA. The Correlation estimate γ (disregarding distributional changes is 0.54 for Italy, 0.52 for Slovenia, 0.46 for the USA, 0.40 for Sweden, 0.36 for the Netherlands and 0.33 for Finland.

Furthermore we included a gender dummy variable, which equals one if the descendant is female as an independent variable in the model. Being female has a significant (on 1% significance level) negative effect in regressions, where either mothers' or fathers' education as independent variables, for the descendants starting primary school before 1960. For the mothers regression it is already insignificant for the regression on descendants starting primary school from 1960 to 1980, while it stays significant (at least at 10% significance level) for the fathers regression. For the regression on descendants starting primary school after 1980 it gets insignificant for both.

Multivariate Analysis - Ordered Logit In order to obtain further evidence on the gender issue also concerning the comparison between the influence of mothers versus fathers and to check for robustness of results, we conduct a multivariate ordered logit estimation, as did for example Bauer and Riphan (2004) or Daouli et al. (2008). Educational attainment of the descendant (E^d) is the dependent variable and educationl attainment of the fathers (E^f) and mothers (E^f) as well as a gender dummy for the descendant equaling one for females are the independent variables. For the sake of including as much observations as possible we integrate in the multivariate case the age of the descendant instead of estimating the regression for the different descendant population subsets ($< 1960, 1960 - 1980, < 1980$). The modes of the educational attainment are excluded for fathers' and mothers' education to serve as reference category. For fathers the mode is e_3 the second lowest category "apprenticeship and vocational school", for mothers the mode is e_4, the lowest educational category "max. compulsory school". Table 5 shows the marginal effects of the ordered logit estimation evaluated at the means and modes. Therefore, the reference desendant is a 48.4 year old female with a father with education level e_3 and a mother with education level e_4. The probabilities for such a descendant having educational levels e_4, e_3, e_2, e_1 are given in the first row of table 5. Having a father with education level e_1 (university, fachhochschule) instead of e_3 increases ceteris paribus the probability of holding a e_1 by 0.245 percentage points. All the

and calculated overall coefficients by averaging cohort coefficients significant marginal effects have the expected signs, higher educated parents lead to higher chances for higher education and lower chances for lower education. Being older leads to a lower probability of higher education and higher probability of lower education. The same holds true for being female. Fathers education seem to have generally a stronger effect than mothers education.

	descendant e_4	descendant e_3	descendant e_2	descendant e_1
	$Pr(Y\|X) = 0.139$	$Pr(Y\|X) = 0.527$	$Pr(Y\|X) = 0.284$	$Pr(Y\|X) = 0.050$
father e_4	0.163***	-0.017	-0.123***	-0.024***
	(0.022)	(0.013)	(0.018)	(0.004)
father e_2	-0.107***	-0.164***	0.195***	0.077***
	(0.014)	(0.027)	(0.0232)	(0.015)
father e_1	-0.147***	-0.358***	0.260***	0.245***
	(0.016)	(0.036)	(0.026)	(0.048)
mother e_3	-0.072***	-0.075***	0.113***	0.034***
	(0.015)	(0.015)	(0.021)	(0.007)
mother e_2	-0.108***	-0.167***	0.197***	0.078***
	(0.015)	(0.030)	(0.026)	(0.016)
mother e_1	-0.121***	-0.217***	0.230***	0.109**
	(0.022)	(0.074)	(0.045)	(0.049)
descendant age	0.002***	0.001***	-0.003***	-0.001***
	(0.000)	(0.000)	(0.001)	(0.000)
descendant female	0.028**	0.019**	-0.038**	-.009**
	(0.011)	(.008)	(0.015)	(0.004)
obs.=1893; Log likelihood=-2040.475; χ-squared=722.83				
Cox-Snell R^2=0.32; Nagelkerke R^2=0.35; McFadden R^2=0.15				
Source: authors calculations on HSHW 2008 data.				
Notes: *,**,*** denotes significance at 10%, 5%, 1% level				
Standard errors are given in parenthesis.				

Table 5: Marginal Effects at Mean (Mode) for Ordered Logit Estimation

4 Conclusions

The Austrian Household Survey on Housing Wealth shows strong persistence in educational attainment. We tested the following questions (i) Is there persistence in educational outcomes, i.e. is the education of parents and descendants positively correlated? (ii) Is persistence relatively strong in comparison to other European countries? (iii) Does the dependence varies over time? (iv) Is gender relevant for the educational outcome?

We find (i) that there is persistence in educational outcomes, i.e. there is positive and significant correlation between educational attainment of fathers and descendants as well as mothers and descendants. The evidence is robust in relation to the use of different approaches, namely the markovian approach and econometric techniques.

We find (ii) that as far as results are comparable the level of correlation seem to be higher than in northern european countries as The Netherlands, Finland or Sweden and closer to southern european countries like Italy or Slovenia.

We find (iii) that the dependence of the educational outcome of the descendants on the education of parents is decreasing over time, a result which is robust over the applied approaches.

We find (iv) that on the one hand being female has a negative impact on educational outcomes of descendants and on the other hand that education of the father has a stronger effect on educational outcames than education of the mother (disregarding distributional differences).
The results therefore question the existence of meritocratic values and equal opportunity for educational advancement in the Austrian society.

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