Returns to Education -
Evidence for Austria

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Abstract

In this paper we make a systematic presentation of returns to education in Austria for the period 1981-1997. We use consistent cross-sections from the Mikrozensus and find somewhat falling returns over time. Some extensions of the basic framework are discussed, like sample selection effects, specification issues and returns to types of schooling

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1. Introduction

This study is an attempt for Austria to establish a systematic presentation of the development of returns to education in the last two decades.[1] Comprehensive studies in the past have been hampered by the lack of comparable data over time. We start with simple human capital earnings functions of the Mincer type. Especially for women, sample selectivity issues warrant a closer look at the base specification to check for selectivity bias. We apply a Heckman-correction by modelling labour force participation of women, but also report results from median regression. Then we expand the analysis to check for robustness of the results by including other control variables often used in earnings regressions. Further issues concern different returns for specific subgroups of the population. Doing this, personnel policies in the public sector can be analysed, the difference between returns to education for employees and self-employed allows also a first pass on the signalling issue, i.e. higher education might not be productive as such but might serve only as a signal to the potential employer.

The basic specification condenses educational attainment simply to the number of years of schooling the individual has attended. This is certainly a simplification. Returns to education may be very different for secondary or tertiary education, between different types of schools, etc. A specific consideration of school types allows also the investigation of issues of linearity of returns to education, as well as the calculation of marginal returns for further years. Due to a lack of suitable instruments, which are also available over time, the question of endogeneity of schooling decisions is not dealt with.[2]

2. Methodology and Data

Ordinary least squares methods are applied to standard Mincerian earnings functions:

$$ln\,W_{it} = b_0 + b_{1t}\ S_{it} + b_{2t}\ EXP_{it} + b_{3t}\ EXP_{it}^2 + u_{it}$$

The dependent variable ($\ln W$) is net hourly wages in logarithmic terms, S are years of schooling, EXP is experience and u, the error term, is assumed to be independent and

[1] See Fersterer and Winter-Ebmer (1999) for a survey on previous work on returns to education in Austria and Christl (1984) for a first study on returns to education for Austria.

[2] Ichino and Winter-Ebmer (1998) present instrumental variables estimates for a very specific situation, which are considerably higher than OLS estimates. Due to this local average treatment effect (LATE) situation, these results are not generalisable.

identically normally distributed with fixed variance σ^2. The index i refers to individuals (i=1,...,n). All regressions were run for men and women separately and are performed for the period t=1981-1997 every second year. This parsimonious specification has the advantage of easy comparability with other studies. It measures returns to education in a comprehensive way: all indirect influences of education on wages - e.g. the choice of better occupations and sectors - is attributed to education directly. We get, therefore, a reduced form coefficient for schooling. It should be clear, that all other variables usually used in wage regressions are potentially endogenous and influenced by education itself.

We use the Austrian Mikrozensus, the only available data source for Austria for such a time period. These data sets are representative 1% household surveys, including detailed information about human capital variables. Net monthly earnings are reported in odd years only, so the cross-section regressions are run every second year. Children allowances, which originally had been included in the earnings data until 1993, were eliminated throughout. Net hourly wages can then easily be constructed by dividing monthly earnings by (working hours per week x 4).

The Mikrozensus contains information about the highest level of schooling achieved. Years of schooling can easily be identified up to the secondary level[3]. Completing the tertiary level is assumed to last 17 years, so students are one average 4 to 5 years at university. For the framework with years of schooling one additional year of schooling has been added for people holding an apprenticeship degree (Lehrabschluß). There is no information about actual work experience or years of work interruption. Therefore we used potential experience defined as (age – years of schooling – 6) in the regressions.

All employees[4] (white-collar, blue-collar and civil servants) aged between 15 and 65 years are included in the sample. Apprentices have been eliminated from the analysed population.

Income taxes in Austria are highly progressive. It follows that net hourly wages of full-time workers are lower compared to net hourly wages of part-time workers. Therefore, we opted for the following procedure: In a first step we eliminated all employees working less than 15 hours per week. Since only approximately 1% of the remaining male workers operate fewer than 35 hours per week, we concentrated only on those workers, who work full time. For women, we added a part-time dummy for those who work between 15 and 34 hours a week, since between 1/5 and 1/4 of all female employees follow a part-time schedule.

[3] Only statutary years were coded; for individuals who had to repeat a year of secondary school, the actual number of years spent in school is underestimated.
[4] Results for self-employed persons are shown below.

To avoid bias from incorrect income data (outliers) we omit all employees, whose net monthly wages are below the minimum contribution level (Mindestbeitragsgrenze) of the Social Security System.[5]

3. Results

3.1. Returns to education

Figure 1 indicates falling returns to education over the entire period 1981 to 1997 for males as well as for females. Especially for women, returns to schooling fell considerably from about 12% to 8% in the first half of the eighties, a decline of more than 4% within 6 years. But this picture is highly misleading due to faulty coding in the data sets.

The Austrian Mikrozensus reports the highest level of schooling achieved. But graduates from teachers' academies were often coded incorrectly as secondary instead of tertiary educated persons. This mistake has been corrected in the Central Statistical Office by consistency checks since 1987, seemingly leading to a sharp increase of graduates from university. Therefore, before 1987, teachers had too low years of schooling implying an upward bias of estimated rates of return. The bias is especially strong for females, because proportionately more girls attend teachers' colleges than boys. To our knowledge, this is the first study to address this issue. Several earlier studies excluded civil servants from the sample which avoids this consistency problem (see Fersterer and Winter-Ebmer (1999) for more details).

There is no simple procedure to overcome this consistency problem. Especially, recoding the observations is impossible. In order to get comparable results over the entire period, we decided therefore to exclude teachers from our sample (about 200 males and 400 females in each year). This procedure also overcomes the problem, that information about hours worked of teachers should be considered with caution. Average returns to schooling calculated from the remaining population are contrasted in Figure 1.

Generally, we find a slightly downward trend in the evolution of returns to schooling. Average returns to one additional year of education fell from 10.3% (11.6%) in 1981 to 7.4% (8%) for men (women) in 1997. (See Tables 1 and 2.) At the beginning of the period, average returns to schooling are slightly higher (about 1%) for females than for males. But this

[5] The minimum contribution level is routinely adapted to the inflation rate, it was $320 in 1991. Approximately 120 – 150 obervations (males and females) have been eliminated each year due to this condition.

difference disappears gradually. The estimates for males are somewhat higher compared to the figures presented by Hofer and Pichelmann (1997)[6], but the same trend over time is reproduced. Although a very parsimonious specification is used, about 25% of the variance in log net hourly wages is explained by the human capital earnings function.

Women following a part-time job earn significantly higher net hourly wages compared to their full-time employed counterparts. But the extent of the difference fell considerably within the period: from about 10% at the beginning to only 3% at the end of the period.

3.2. Returns to experience

Earnings-experience profiles give information to what extent additional years of work experience are honoured by employers. In human capital theory, returns to experience arise due to general on-the-job training. Therefore earnings-experience profiles are expected to show a concave pattern, indicating rising marginal costs and/or falling marginal returns to training over the live cycle.

Our estimated profiles show the expected concave pattern (see Tables 1 and 2 as well as Figure 2) for both genders. However, the profiles behave very differently over time. For males, returns to experience are relatively stable within the period examined (therefore only one the profile for 1981 is depicted in Figure 3). In contrary, in 1997 for women the profile became extremely flat compared to that in 1981. Mind that we use potential instead of actual experience in the regressions. This will bias the estimated earnings-experience profile downwards, especially for women, since potential experience will overstate actual experience grossly if there are significant work interruptions.

4. Extensions

In this section extensions to the basic specification are made to check for robustness of the results. The first issue concerns the problem of inferring returns to education from a sample of working people only (sample selectivity problem). Standard economic theory would suggest, that those who do supply zero hours of labour, will do so because they have lower market

[6] Hofer and Pichelmann (1997) use the same data set and estimate earnings functions from 1981 to 1995 for males, again every second year. Besides the standard human capital variables, they additionally include a dummy for white-collar workers and interaction terms between white-collar and experience and experience^2, a vector of 8 industry dummies and a foreigner dummy in their regression. Moreover, they excluded civil servants from the analysed population.

wages, i.e. possibly also lower expected returns to their education. Heckman's sample selectivity approach will be used to deal with this issue. Later we will add further explanatory variables to the simple Mincer equation. Results for various sub-groups are presented as well as more detailed results for different types of schools. For the most part of the extensions we use only the 1995 cross-section of the Austrian Mikrozensus.

4.1. Sample selectivity correction for women

Estimates of human capital functions for women may potentially be biased, because the sample underlying the estimation is not randomly drawn. We therefore included a Heckman correction term to control for such a bias. Variables concerning personal characteristics (years of schooling, age, age squared, nationality) as well as family background (marital status, number of children at different ages) are used to identify participation in the labour force.

Estimates of the human capital function with and without a Heckman correction term are presented in Table 3. Although the Heckman correction term is highly significant, it does not seem, that the estimates of the earnings function suffer from sample selection bias seriously. This finding is also supported in Table 8, where we report estimates of earnings functions using educational levels attained instead of years of schooling. A more informal way of controlling for selection bias is to use median regression (Buchinsky, 1994), which is especially robust with respect to outliers.[7] The results in Table 3, Column 3 complement the picture: the returns to education are in a very narrow band, between 6.6% and 7.1% earnings gain per year of education. The same applies to returns to experience. The coefficient for part-time work is cut in half in the median regression, which might be due to the discounting of outliers.

4.2. Additional control variables

Tables 4A and 4B compare returns to education obtained from the inclusion of various additional control variables. Family background (marital status, number of children below age 4), nationality (native – foreigner) as well as 9 county, 4 city size, and 57 industry dummies, are used to extend the Mincerian earnings equation.

[7] Median regression was also performed using the whole sample including the workers with earnings below the social security's minimum contribution level. The results are very robust.

This check indicates that the standard earnings functions are rather robust, since none of the additional included variables is able to change the estimates of returns to schooling, experience or experience squared significantly. The only exception is the inclusion of industry dummies for women: the inclusion of industry dummies leads to a drop in returns to schooling from 6.8% to 6.1%.

Tables 4A and 4B reveal other well known results: foreign citizens – which are predominantly from former Yugoslavia – earn about 15% less compared to their native counterparts; the wage differential is higher for men than for women. The number of children below 4 years of age does affect wages of females negatively (-3.3%) but does not influence wages of males. There exists also a sizeable marriage premium for men: married males earn significantly more (6.9%) than singles; the effect for females is comparable high (8.1%) but goes in the opposite direction.

4.3. Returns to human capital for different subgroups of workers

Returns to schooling can be expected to differ substantially across different subgroups of workers, between employees and self-employed persons and between private and public employees. Several issues can be discussed under this heading: i) educational attainment as a signalling device, ii) the difference of pay determination in the market versus administrative wage setting, and iii) returns to education and career paths for white- and blue-collar jobs.

The returns to human capital for various sub populations are reported in Tables 5A and 5B. Since there is a serious survey non-response problem for self-employed (only 10% of the self-employed persons report their income, see Table 6), we had to pool observations form 3 subsequent years (1991, 1993 and 1995) to increase our sample size. We, therefore, included annual dummies to control for changes over time affecting all persons equally.

The signalling hypothesis (Spence, 1973) can explain higher wages for more highly educated workers even in the absence of productivity-enhancing effects of schooling. Education could simply sort inherently productive workers from the rest. Students with higher productivity find it easier to incur more schooling and, therefore, employers choose more educated students and pay them higher wages. One simple way to test for signalling is to compare returns to education for employed and self-employed workers. For self-employed there is no need to signal one’s competence by presenting a schooling degree, higher wages should only be due to higher productivity as such.

In Tables 5A and 5B returns to education are compared for self-employed and all employees. Owing to strict pay scales in the public sector, the proper comparison group is all private-sector employees. For males, we find practically no difference in the returns to education for self-employed and private-sector employees. In the case of females, private-sector employees get returns per year of schooling 1.6% higher than the self-employed; a difference which can be attributed to signalling effects.[8]

Wage determination in the private and public sector is markedly different. Both men and women get lower returns to education in the public sector: men (women) in the public sector get only 70% (52%) of possible returns in the private sector. Together with higher entry wages, this phenomenon speaks for a compressed administrative wage scale for public servants. Notice though, that sector selection cannot be taken as randomly assigned. Education, on the one hand, is influencing sectoral choice, together with risk-aversion, motivation and different occupational amenities in private and public sector jobs. Therefore, the results should be interpreted cautiously. Returns to education in the public sector are particularly low for females. Given relatively strict career schemes – relying on education and tenure, our use of potential experience instead of actual experience will in the public sector not only bias returns to experience downwards, but also those for education.[9] Moreover, as most jobs in the public sector are white-collar jobs, returns for public sector workers could be compared with those for white-collar workers only, which gives us somewhat lower differentials.[10]

As expected, returns to education are twice as high for white-collar as compared to blue-collar workers (approximately 8% vs. 4%). Returns are particularly low for unskilled female blue-collars, which might be due to the low variation in educational attainment in this group. Moreover, more highly-educated workers would certainly be overeducated for these jobs (Sicherman, 1991).

Earnings-experience profiles differ substantially by gender as well as across various occupational categories. The profiles for men are rather steep compared to those for women, giving rise to much higher earnings later in the career. Again, these results should be seen in connection with the use of potential experience. Whereas the curvature of earnings-experience

[8] As Zweimüller (1992) points out, sample selection bias due to survey non-response might be a serious problem, which in our case, given the very high non-response rate for self-employed, could affect the returns for self employed severely.

[9] Winter-Ebmer and Zweimüller (1994) use actual experience for 1983 and find a much lower difference in returns to education for females in private vs. public sector jobs.

[10] See Boss et al (1997) for an extensive study on life-time earnings profiles of private and public-sector workers.

profiles of males is steepest for self employed and white-collar workers, the curvature of the profiles for women is rather similar across various occupational categories.

Returns to education for foreigners are much lower than those for natives, the are approximately at a level of 55% for males and 60% for females (see Table 7). Similar reasoning applies to returns to work experience. Without a proper consideration of issues of adaptation to the Austrian labour market, especially concerning the length of stay in Austria and the transferability of schooling degrees from abroad or the language problem, the presentation of these differentials must be seen as preliminary.

4.4. Returns to different types of schools

So far we used years of schooling as our measure of educational attainment. This crude measure will now be complemented with a more detailed investigation by looking at returns to specific school types. On the one hand, the linearity assumption implicit in the years-of-schooling specification, can now be tested. This is particularly interesting given the recent discussion about heterogeneous returns for specific groups.[11] On the other hand, credentialism suggests, that not actual years spent on the school bench are the most important thing, but the degree gained.[12] Moreover, for choice of schooling type, returns to different types of schooling (at the same level, say secondary) are important in itself.

Returns to the different types of secondary and tertiary education are given in Table 8. School types are ranked by increasing number of (required) years of schooling. Returns to degrees achieved are rising unequivocally with required years of education. The differences between two adjacent school types are generally significant; the only exceptions are the difference between females with secondary academic schools and females with vocational colleges completed[13] as well as the difference between males having finished vocational colleges and short non-university education, respectively.

Differences by gender at various educational levels are in general not significant. The gap of about 9 percentage points between male and female short non-university graduates is at the 10% level statistically significant. For a proper interpretation of these differences, the proportion of students in the different school types among "short non-university" i.e. teacher's colleges, military academy, etc. must be taken into account. On the other hand, male

[11] See Card (1999) for a model, Ichino and Winter-Ebmer (1999) for an application to Germany.
[12] Here, both the information about the actual number of years spent in school and the highest degree attained is necessary, which is not available so far. Especially in Austria, many students have to repeat years in secondary school. Likewise, average time for a tertiary degree is much higher than the minimum number of years required.

university graduates earn a wage premium of 8-9 percentage points over their female colleagues.[14]

Having done this more detailed calculation for returns, it is suggestive to calculate average returns for a year spent in school for different types of school. This can be taken as a measure of school productivity. This simulation faces several difficulties. First, to calculate average returns by year, it must be assumed how long a student has attended a specific school. Here we use statutory years for all types of secondary education. For university students we offer two simulations, one where we assume 5 years of study (close to statutory years, which are different by study type) and 7 years (close to the actual number of years students spend at universities). Second, for students in tertiary education, the *marginal* gain from tertiary education has to be calculated. Therefore, we deduct from the respective coefficients for tertiary education in Table 8 the average return to secondary academic schools (0.337 for women, 0.355 for men). Secondary academic schools are the typical entrance gate to universities in Austria. Geometric means are used in the calculations.[15]

Marginal returns to a further year of education are strongly declining, both for males and for females. A year of vocational school offers the highest returns. Interestingly, years of vocational colleges do not offer higher returns than those spent in secondary academic schools. This is contrary to widespread expectations, that vocational colleges (business or especially technical ones) offer a more practical education as compared to the secondary academic schools, who are primarily seen as a preparatory school for university entrants. This issue warrants further investigation, especially because of the selective character of the sample: we measure the returns to secondary schooling only for those who refrain from tertiary education.

Returns to tertiary education are particularly low, especially if we calculate the returns by using actual years spent in the university: around 3% per year.

[13] The difference is significant at 10%
[14] See Lassnigg et al (1998) on earnings of university graduates.
[15] We take changes in the educational system, i.e. the change in statutory length of vocational schools, etc. into account by using population means.

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Table 1: Estimates of Basic Mincer Equation 1981 - 1997: Males (without teachers)

	1981	**1983**	**1985**	**1987**	**1989**	**1991**	**1993**	**1995**	**1997**
Years of schooling	0.103	0.098	0.096	0.093	0.097	0.088	0.094	0.080	0.074
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Experience (potential)	0.022	0.027	0.028	0.022	0.021	0.021	0.020	0.029	0.024
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Experience squared [a)]	-0.029	-0.036	-0.035	-0.026	-0.022	-0.024	-0.019	-0.038	-0.028
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	2.656	2.744	2.812	2.967	3.034	3.261	3.277	3.440	3.551
	(0.025)	(0.026)	(0.026)	(0.024)	(0.027)	(0.026)	(0.028)	(0.023)	(0.026)
R^2 adj.	0.224	0.244	0.264	0.248	0.228	0.230	0.241	0.283	0.275
Sample size	9983	8541	8094	8509	7879	7311	7171	7215	5385

Note: Standard errors in parenthesis
[a)] parameter multiplied by the factor 100

Table 2: Estimates of Basic Mincer Equation 1981 – 1997: Females (without teachers)

	1981	1983	1985	1987	1989	1991	1993	1995	1997
Years of schooling	0.116 (0.003)	0.113 (0.003)	0.110 (0.003)	0.095 (0.003)	0.104 (0.003)	0.098 (0.003)	0.089 (0.003)	0.079 (0.002)	0.080 (0.003)
Experience (potential)	0.028 (0.001)	0.028 (0.001)	0.028 (0.001)	0.025 (0.001)	0.022 (0.001)	0.019 (0.001)	0.019 (0.002)	0.016 (0.001)	0.014 (0.002)
Experience squared [a)]	-0.044 (0.003)	-0.043 (0.003)	-0.040 (0.003)	-0.038 (0.003)	-0.026 (0.003)	-0.021 (0.003)	-0.022 (0.004)	-0.017 (0.003)	-0.010 (0.004)
Part-time (0,1)[b)]	0.080 (0.012)	0.113 (0.013)	0.097 (0.012)	0.082 (0.011)	0.054 (0.012)	0.014 (0.011)	0.050 (0.012)	0.032 (0.009)	0.026 (0.010)
Constant	2.268 (0.036)	2.409 (0.036)	2.478 (0.034)	2.767 (0.033)	2.772 (0.037)	2.963 (0.034)	3.139 (0.036)	3.358 (0.030)	3.409 (0.034)
R^2 adj.	0.240	0.272	0.288	0.233	0.221	0.223	0.200	0.220	0.232
Sample size	5284	4629	4638	4950	4546	4703	4461	4700	3492

Note: Standard errors in parenthesis
[a)] parameter multiplied by the factor 100
[b)] parameter transformed by exp(β)-1

Table 3: **Selectivity correction for women (1995)**

	Selectivity correction		**Median**
	No	**Yes**	**Regression**
Years of schooling	0.068 (0.002)	0.066 (0.002)	0.071 (0.002)
Experience (potential)	0.016 (0.001)	0.017 (0.001)	0.017 (0.002)
Experience squared [a)]	-0.017 (0.003)	-0.015 (0.003)	-0.020 (0.004)
Part-time [b)]	0.027 (0.009)	0.047 (0.009)	0.013 (0.010)
λ	--	-0.085 (0.013)	--
Constant	3.480 (0.023)	3.530 (0.024)	3.436 (0.027)
R^2 adj.	0.255	--	--
Sample size	5058	10442/5058	5058

Note: Standard errors in parenthesis
[a)] parameter multiplied by the factor 100
[b)] parameter transformed by exp(β)-1

Table 4A: Inclusion of additional control variables (men, 1995)

	None	**family**	**family, nationality**	**county, city size**	**county, city size, industry**	**all**
Years of schooling	0.071 (0.002)	0.069 (0.002)	0.066 (0.021)	0.070 (0.002)	0.073 (0.002)	0.069 (0.002)
Experience (potential)	0.029 (0.001)	0.024 (0.001)	0.023 (0.001)	0.029 (0.001)	0.029 (0.001)	0.024 (0.001)
Experience squared [a]	-0.039 (0.002)	-0.032 (0.003)	-0.031 (0.003)	-0.039 (0.002)	-0.039 (0.002)	-0.031 (0.002)
Married (0,1)[b]	--	0.069 (0.009)	0.081 (0.009)	--	--	0.081 (0.008)
Children<4 years	--	0.000 [c] (0.007)	0.004 [c] (0.007)	--	--	0.003 [c] (0.007)
Nationality (0,1)[b]	--	--	-0.153 (0.011)	--	--	-0.171 (0.011)
Constant	3.537 (0.021)	3.568 (0.021)	3.607 (0.021)	3.570 (0.024)	3.453 (0.177)	3.690 (0.174)
Counties (9)[d]	--	--	--	7.20	7.24	10.31
City size (4)[d]	--	--	--	3.99	3.23	7-79
Industries (57)[d]	--	--	--	--	11.65	11.23
R^2 adj.	0.302	0.309	0.327	0.309	0.364	0.391
Sample Size	7022	7022	7022	7022	7022	7022

Note: Standard errors in parenthesis
[a] parameter multiplied by the factor 100
[b] parameter transformed by exp(β)-1
[c] not significant
[d] F-value presented

Table 4B: Inclusion of additional control variables (women, 1995)

	None	family	family, nationality	county, city	county, city size, industry	all
Years of schooling	0.068 (0.002)	0.070 (0.002)	0.068 (0.002)	0.066 (0.002)	0.061 (0.002)	0.061 (0.002)
Experience (potential)	0.017 (0.001)	0.021 (0.001)	0.022 (0.001)	0.016 (0.001)	0.016 (0.001)	0.020 (0.001)
Experience squared [a)]	-0.018 (0.003)	-0.026 (0.003)	-0.027 (0.003)	-0.019 (0.003)	-0.019 (0.003)	-0.026 (0.003)
Part-time (0,1)[b)]	0.025 (0.009)	0.048 (0.009)	0.040 (0.009)	0.025 (0.009)	0.023 (0.008)	0.035 (0.009)
Married (0,1)[b)]	--	-0.081 (0.008)	-0.073 (0.008)	--	--	-0.057 (0.008)
Children<4 years	--	-0.033 (0.014)	-0.026 (0.014)	--	--	-0.032 (0.014)
Nationality (0,1)[b)]	--	--	-0.120 (0.014)	--	--	-0.130 (0.014)
Constant	3.477 (0.023)	3.447 (0.023)	3.472 (0.023)	3.554 (0.026)	3.729 (0.115)	3.789 (0.142)
Counties (9) [d)]	--	--	--	6.03	5.90	8.07
City size (4) [d)]	--	--	--	13.87	8.69	9.29
Industries (57) [d)]	--	--	--	--	8.59	7.76
R^2 adj.	0.259	0.275	0.285	0278	0.344	0.356
Sample Size	5056	5056	5056	5056	5056	5056

Note: Standard errors in parenthesis
[a)] parameter multiplied by the factor 100
[b)] parameter transformed by exp(β)-1
[c)] not significant
[d)] F-value presented

Table 5A: Returns to human capital for various subgroups (men)

	years of schooling	experience (potential)	experience squared [a)]	Constant	R^2 adj.	Sample Size
All	0.077 (0.001)	0.023 (0.001)	-0.027 (0.002)	3.430 (0.014)	0.301	21357
Self employed	0.102 (0.012)	0.043 (0.011)	-0.062 (0.022)	2.780 (0.206)	0.372	155
All employees	0.077 (0.001)	0.023 (0.001)	-0.026 (0.002)	3.519 (0.014)	0.301	21202
Civil Servants	0.067 (0.001)	0.018 (0.001)	-0.011 (0.003)	3.585 (0.022)	0.417	5055
All private employees	0.097 (0.002)	0.026 (0.001)	-0.033 (0.002)	3.310 (0.019)	0.292	16147
White collar workers	0.080 (0.002)	0.040 (0.002)	-0.051 (0.004)	3.241	0.367	4964
Skilled blue collar workers	0.043 (0.006)	0.022 (0.001)	-0.031 (0.003)	3.896	0.188	6504
Unskilled blue collar workers	0.038 (0.005)	0.012 (0.001)	-0.016 (0.003)	3.877 (0.053)	0.100	4679

Note: Standard errors in parenthesis; observations pooled over the years 1991, 1993 and 1995; annual dummies included in all regressions

[a)] parameter multiplied by the factor 100

Table 5B: Returns to human capital for various subgroups (women)

	years of schooling	experience (potential)	experience squared [a]	Part-time (0,1)[b]	Constant	R^2 adj.	Sample Size
All females	0.072 (0.001)	0.019 (0.001)	-0.021 (0.002)	0.032 (0.006)	3.240 (0.015)	0.290	14879
Self employed	0.073 (0.017)	0.016 [c] (0.012)	-0.022 [c] (0.022)	0.395 (0.114)	3.146 (0.296)	0.252	97
All employees	0.072 (0.001)	0.018 (0.001)	-0.021 (0.002)	0.030 (0.006)	3.238 (0.015)	0.294	14782
Civil servants	0.046 (0.002)	0.019 (0.002)	-0.022 (0.004)	0.047 (0.012)	3.685 (0.027)	0.278	3365
All private employees	0.089 (0.002)	0.018 (0.001)	-0.019 (0.002)	0.029 (0.006)	3.144 (0.022)	0.259	11417
White collar workers	0.076 (0.002)	0.024 (0.001)	-0.026 (0.003)	-0.002 [c] (0.008)	3.356 (0.028)	0.285	6663
Skilled blue collar workers	0.039 (0.013)	0.011 (0.003)	-0.010 [c] (0.008)	0.034 [c] (0.025)	3.358 (0.136)	0.143	889
Unskilled blue collar workers	0.009 (0.005)	0.006 (0.001)	-0.007 (0.003)	0.072 (0.009)	3.931 (0.048)	0.153	3865

Note: Standard errors in parenthesis; observations pooled over the years 1991, 1993 and 1995; annual dummies included in all regressions

[a] parameter multiplied by the factor 100

[b] parameter transformed by exp(β)-1

[c] not significant

Table 6: Income variable survey non-response (%)

	women		men	
	not reported	**reported**	**not reported**	**reported**
Self employed	90.5	9.5	89.5	10.5
Civil servants	36.5	63.5	43.0	57.0
White collar workers	32.7	67.3	32.3	67.7
Skilled blue collar workers	33.9	66.1	32.4	67.6
Unskilled blue collar workers	28.1	71.9	30.3	69.7

Table 7: Returns to human capital for natives and foreigners (1995)

	all	**natives**	**foreigners**
men			
Years of schooling	0.071 (0.002)	0.070 (0.002)	0.039 (0.006)
Experience (potential)	0.029 (0.001)	0.030 (0.001)	0.014 (0.004)
Experience squared [a)]	-0.041 (0.003)	-0.019 (0.008)	-0.039 (0.002)
Constant	3.537 (0.021)	3.534 (0021)	3.910 (0.072)
R^2 adj.	0.302	0.256	0.106
Sample size	7022	6522	500
women			
Years of schooling	0.068 (0.002)	0.067 (0.002)	0.040 (0.007)
Experience (potential)	0.017 (0.001)	0.018 (0.002	0.000 (0.005)
Experience squared [a)]	-0.018 (0.003)	-0.021 (0.003)	0.010 (0.013)
Part-time (0,1)[b)]	0.025 (0.009)	0.018 (0.009)	0.040 (0.037)
Constant	3.477 (0.023)	3.479 (0.024)	3.804 (0.091)
R^2 adj.	0.259	0.264	0.092
Sample size	5056	4747	309

Note: Standard errors in parentheses
a) parameter multiplied by the factor 100
b) parameter transformed by exp(β)-1

Table 8: Returns to different types of schools (1995)

	Women	**Men**
Compulsory schooling (base)		
Apprenticeship [a)]	0.127 (0.010)	0.149 (0.009)
secondary		
Vocational schools [a)]	0.317 (0.013)	0.289 (0.015)
Secondary academic schools [a)]	0.409 (0.020)	0.418 (0.020)
Vocational colleges [a)]	0.494 (0.017)	0.510 (0.016)
tertiary		
Short non-university [a)]	0.610 (0.024)	0.491 (0.032)
University [a)]	0.696 (0.027)	0.804 (0.021)
Experience (potential)	0.019 (0.001)	0.030 (0.001)
Experience squared [b)]	-0.026 (0.003)	-0.046 (0.002)
Part-time (0,1) [a)]	0.034 (0.008)	--
Constant	4.007 (0.014)	4.097
R^2 adj.	0.291	0.309
Sample Size	5186	7475

Note: Standard errors in parentheses; *Vocational schools (berufsbildende mittlere Schulen):* vocational, technical, artistic schools, business schools, schools for social professions (nurses etc.), agricultural schools which last 2-4 years; *Vocational colleges (berufsbildende höhere Schulen):* like vocational schools but they last 5 years and give access to further short non-university and university education; *Secondary academic schools (allgemeinbildende höhere Schulen)*: 4 years of higher general education giving access to further short non-university and university; *Short non-university (hochschulverwandte Lehranstalten):* academies for social professions, colleges for higher medical-technical services, military academies, teachers' colleges (3 year courses);

[a)] parameter transformed by exp(β)-1

[b)] parameter multiplied by the factor 100

Table 9: Average Annual returns for different types of schools (in %, 1995)

	Women	**Men**
Apprenticeship	0.076	0.092
secondary		
Vocational schools	0.121	0.106
Secondary academic schools	0.097	0.098
Vocational colleges	0.086	0.093
tertiary		
Short non-university	0.044	0.019
University (5 years assumed)	0.041	0.048
University (7 years assumed)	0.029	0.033

Note: We assumed statutory years for secondary education, 5 respectively 7 years for a university degree. For students in tertiary education the returns to secondary academic school (i.e. the principal route towards university entrance) have been deducted

Figure 1: Returns to schooling 1981 – 1997

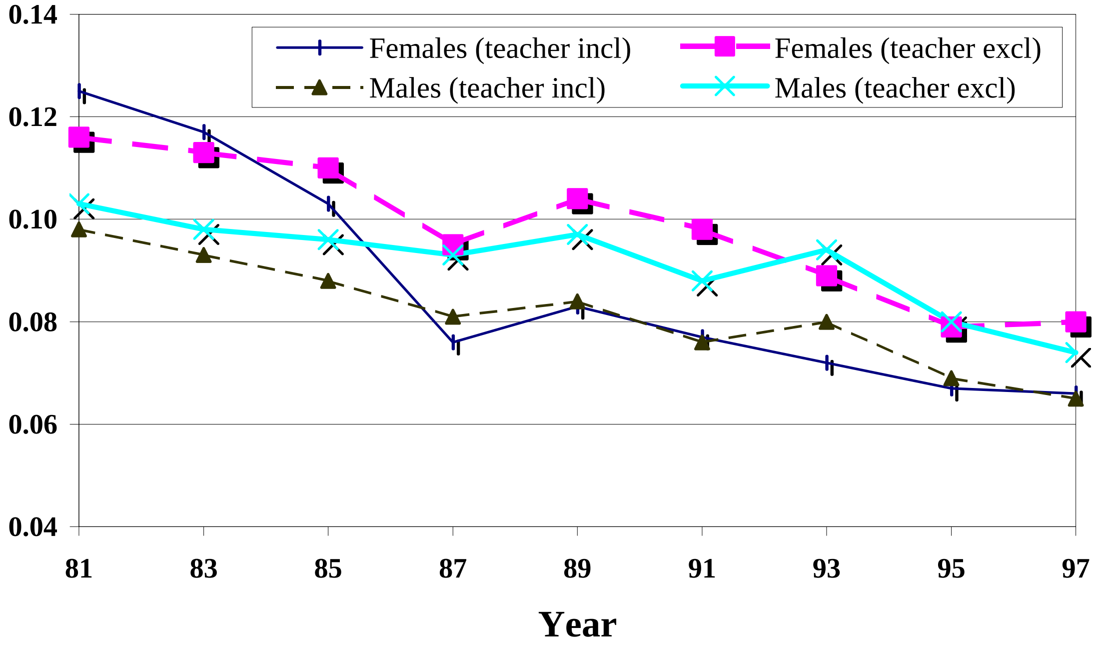

Figure 2: Earnings-experience profiles (selected years)