NEW SZÉCHENYI PLAN

ECONOMICS OF EDUCATION

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Week 5

Cost- Benefit Analysis in Education 2

Rate of returns – earnings function method

W= f (years of schooling, age, gender ....)

$$\ln(W_i) = \alpha \cdot S_i + \beta EX_i + \gamma EX_i^2 + \varepsilon_i$$

$$\alpha = \frac{\partial \ln(W)}{\partial S} \approx r \quad (\%)$$

$$\ln w_i = a \cdot ALT_i + b \cdot KOZ_i + c \cdot FELS_i + dEX_i + eEX_i^2 + \varepsilon_i$$

$r_{alt} = b / S_a$

$r_{koz} = (b - a) / (S_k - S_a)$

$r_{fels} = (c - b) / (S_F - S_k)$

Result of earnings regressions (stata)

Hungary, 2009 private sector

```
. regress lnker  iskev exp exp2,robust

Linear regression                                      Number of obs =  192760
                                                       F(  3,192756) =28667.10
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.3432
                                                       Root MSE      =  .49175
```

lnker	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
iskev	.1486063	.0005194	286.13	0.000	.1475884	.1496243
exp	.0196935	.0003854	51.09	0.000	.018938	.0204489
exp2	-.0003101	7.73e-06	-40.12	0.000	-.0003253	-.000295
_cons	9.925003	.0079269	1252.07	0.000	9.909466	9.940539

lnker= log wages,

iskev= years of schooling; exp =years of labor market experience

Based on data of Hungarian Wage Tariff Survey 2009.

```
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             |               Robust
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       _cons |   9.925003   .0079269  1252.07   0.000     9.909466    9.940539
------------------------------------------------------------------------------
```

Based on data of Hungarian Wage Tariff Survey 2009.

```
. regress lnker  szakm kozepf felsof exp exp2,robust

Linear regression                               Number of obs =  192760
                                                F(  5,192754) =18787.32
                                                Prob > F      =  0.0000
                                                R-squared     =  0.3450
                                                Root MSE      =   .4911

------------------------------------------------------------------------------
             |               Robust
       lnker |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       szakm |   .1616752   .0028687    56.36   0.000     .1560527    .1672978
      kozepf |   .4507761   .0030585   147.39   0.000     .4447816    .4567706
      felsof |   1.022121   .0037349   273.67   0.000     1.014801    1.029442
         exp |   .0214718   .0003854    55.72   0.000     .0207165    .0222271
        exp2 |  -.0003553   7.68e-06   -46.26   0.000    -.0003704   -.0003403
       _cons |   11.26442   .0049007  2298.53   0.000     11.25482    11.27403
------------------------------------------------------------------------------
```

lnker= log wages; szakm = vocational secondary dummy; kozepf = general secondary dummy; felsof = college dummy; exp = years of labor market

Based on data of Hungarian Wage Tariff Survey 2009.

```
. regress lnker  szakm kozepf felsof exp exp2,robust

Linear regression                                      Number of obs =  192760
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Based on data of Hungarian Wage Tariff Survey 2009.

How returns to education have changed during transition in Hungary? (OLS estimation results)

	α
1986	0.058
1989	0.075
1992	0.092
1995	0.106
1998	0.112
2000	0.124

Controlled for age, gender, region, industry. etc. Private sector N=150,000

Source: estimations of János Köllő, using data from Hungarian Wage Tariff Surveys

How returns to education and labor market experience have changed during transition in Hungary? (OLS estimation results)

	r	β_1	β_2
1986	.058	.030	-.044
2000	.124	.020	-.028

Controlled for age, gender, region, industry, etc. Private sector N=150,000

Source: estimations of János Köllő, using data from Hungarian Wage Tariff Surveys

Measurement problems

Costs – foregone earnings, no direct costs included

Measurement problems – ability bias

- Standard OLS Mincer-type regressions run on cross-section data, compares earnings and education levels of different individuals.
- We can not control for all other factors that might affect earnings but not are caused by education.

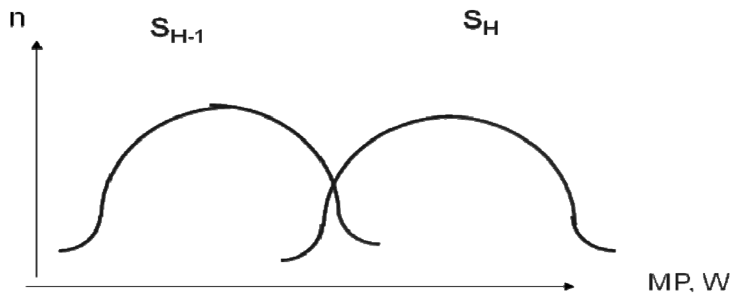
- Unmeasured factors that increase earnings (ability etc.) tend to increase education as well – ability bias.

$$\ln\left(W\right) = b_0 + bs + a + \varepsilon$$ true model – ability a

$$\ln\left(W\right) = \beta_0 + \beta s + u$$ a is omitted from regression

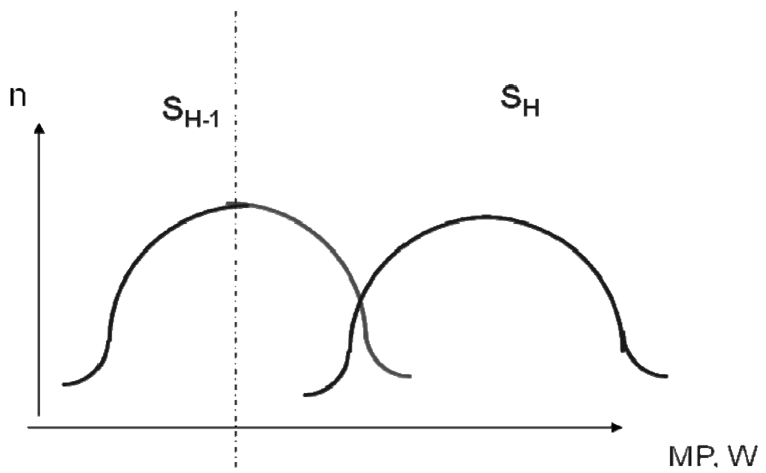
$$p\lim\left(\hat{\beta}^{OLS}\right) = b + \frac{Cov\left(a,s\right)}{Var\left(s\right)}$$ omitted variables bias

Measurement problems – selectivity bias



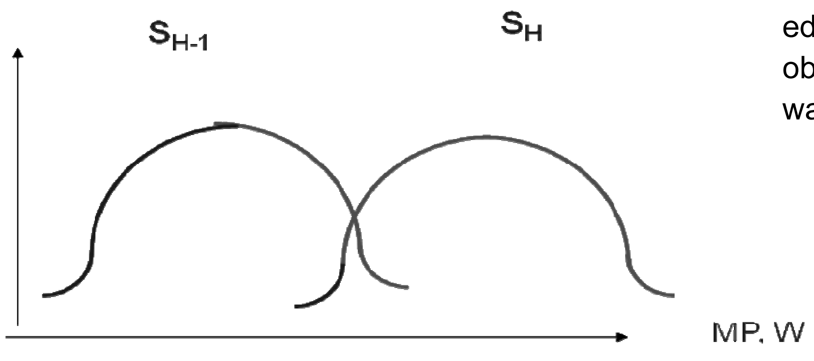
Earnings regressions are based on earnings data of employed people.

Measurement problems – selection in to employment – selectivity bias



- Employment rates of the less educated people are lower than employment rates of more educated people.
- If among the less educated the more able are employed, their observed wages are higher than that of the whole population.

Measurement problems – selectivity bias



Employment rates of the better educated are higher, their observed wages are close to wages of the whole population.

Earnings differences underestimate the expected returns to education.

Solutions to omitted ability bias

1. Instrumental variable (IV) method

2. Twin studies

3. Better controls for ability (IQ tests etc.)

Solutions to omitted variable bias – Instrumental variable method

Instrument:

Correlated with S, but uncorrelated with ability.

Often used instruments:

- quarter of birth, month of birth
- compulsory school age changes

Often find higher returns than OLS

Twin studies

Assumption: twins' have identical ability $a_{1i}=a_{2i}$

$$\ln\left(W_{1i}\right)=b_0+bs_{1i}+a_{1i}+\varepsilon_{1i}$$

$$\ln\left(W_{2i}\right)=b_0+bs_{2i}+a_{2i}+\varepsilon_{2i}$$

Can not estimate OLS as *s* may be correlated with *a*

Take differences:

$$\Delta \ln\left(W_i\right) = b_0 + b\Delta s_i + \Delta\varepsilon_i$$

Often find lower return than OLS

First study: Taubman (1976)

Rates of returns to education – earnings function method (OLS)

Country	Mean per capita income US$	Years of schooling	Coefficient%
High income	23 463	9.4	7.4
Middle income	3 025	8.2	10.7
Low income	375	7.6	10.9
Total	9 160	8,3	9.7

Source: G. Psacharoupolos -H.A. Patrinos: Returns to Investment in Education. A Further update. World Bank Policy Research Working Papers 2002.