Exam SØK3521 May 2022

Answer all 4 questions. Share of marks included with each question.

Question 1 (30%) Human Capital

Consider the following mincerian wage equation

$$\ln(w_i) = \beta_0 + \beta_1 yos_i + \beta_2 exp_i + \beta_3 exp_i^2 + \varepsilon_i \qquad (1)$$

Which states that (log) wages (w) of individual *i* are a function of years of schooling, labour market experience (exp) and the labour market experience squared (exp^2). While ε is an error term :

a. Why is it a standard finding that β_2 >0 and β_3 <0 (the returns to experience are positive but at a declining rate)?

This follows from experience in work leading to higher productivity through, for instance, learning on the job and training. It declines later for a number of reasons, one is that it may simply reflect decreasing returns to experience. However, another standard human capital explanation is that, as human capital depreciates, workers must continually train etc to keep their productivity at a certain level. As individuals approach the end of their career it becomes less optimal to pursue these costly investments as there is less time to gain the rewards.

b. Imagine we estimate (1) on a representative sample of the population and find that $\widehat{\beta_1}$ =0.07. What does this tell us about the relationship between years of schooling and wages? What are the problems with interpreting this causally?

This provides the average difference in earnings across individuals at different levels of schooling. For example two individuals with 2 years different schooling would expect 14% different earnings. The key problem is that education is a choice and it is likely that individuals who choose higher levels of education have other, unobserved, characteristics which make them more productive in the labour market.

An excellent answer may have used diagrammes like those in the lectures which demonstrate how differences in earnings between two individuals reflect a combination of causal education effects and differences in ability. Hence, one cannot interpret the overall differences causally.

c. Discuss how changes in regulations such as compulsory school laws can be used to estimate the causal returns to schooling.

The intuition is that changes in compulsory laws remove the choice aspect of education. For example ROSLA reforms lead to some individuals taking an extra year of school because the minimum school leaving age goes up. Hence, the only difference between these individuals is the year they were born. This can, in theory, remove the ability bias described in 1b. A downside is that it only provides the causal effect of schooling for those individuals who would have dropped out at an early age. Hence, it is not informative regarding the average returns to schooling, or university education.

Question 2 (30%) Educational Production

Appendix 1 provides an individual country differences in attainment. These differences are decomposed into unaccounted and accounted for differences in terms of inputs into an educational production function.

a. Using an education production function approach provide an interpretation of these differences. (Hint: focusing on one or two countries may make this easier)

Here the idea was to (a) set out an education production function (from the lectures) and discuss how (a) inputs lead to (accounted for) differences in educational performance and (b) how we can interpret the unaccounted for differences in performance. For instance, that certain countries are better or worse than other countries in transforming a given set of inputs into educational outputs.

b. Take one country (for instance Norway) and provide policy advice on the basis of this evidence.

Using this framework, discuss what policy makers could do to improve a countries performance. For instance, for Norway it is seems that the focus should be on the quality of the educational production function rather than inputs. For instance, teaching practices, school management etc rather than more family or school inputs.

Question 3 (20%) Peer Effects

a. What do we mean by peer effects in schooling, what are the difficulties in estimating peer effects, and why are peer effects important for policy?

Peer effects are spillovers across students, typically within the class room. I.e. when a given student's performance is, in part, a function of other student's performance, behaviour, or effort choices.

Key issues relate to the reflection problem (bi-directional effects), non-random selection into groups, and common shocks.

Re: policy discuss linear vs non-linear peer effects, and the potential for (a) overall student performance to be improved by changing peer groups and/or (b) a reduction in inequality from changing peer groups.

Question 4 (20%) Teachers

a. How could performance related pay schemes be used to increase teacher effectiveness? Discuss limitations / concerns with this approach.

The key point is to (a) discuss the principal agent problem in educational production. Schools seek to maximise some objective that is not necessarily part of the teacher's objective function. There is imperfect information regarding effort choices of teachers, and a stochastic element to production. Use the standard piece rate model to show how performance pay can increase effort, while increasing worker utility.

Limitations range from unnecessary focus on measurable outputs (tested subjects vs non-tested subjects), crowding out of intrinsic motivation, gaming/cheating, teaching to the test, reduction in co-operation between teachers.

Table 4

Accounting for Each Country's Difference from the International Mean

	Observed difference (1)	*Unaccounted difference* (2)	*Accounted difference* (3)	*Of which: accounted for by*		
				Family background (4)	*School resources* (5)	*Institutions* (6)
Finland	44.5	31.7	12.9	2.7	−1.3	11.5
Korea	42.0	14.3	27.7	13.0	5.6	9.1
Netherlands	38.4	−8.0	46.4	−3.4	−0.3	50.1
Japan	34.0	4.4	29.6	17.5	2.9	9.2
Canada	33.0	17.4	15.6	15.9	3.2	−3.5
Belgium	29.5	−11.8	41.3	−1.2	1.4	41.0
Switzerland	26.5	27.3	−0.8	−13.2	9.5	2.9
Australia	24.5	2.1	22.4	14.0	6.6	1.7
New Zealand	24.5	17.8	6.7	16.2	−3.0	−6.4
Czech Republic	16.4	2.1	14.3	16.1	−9.0	7.2
Iceland	15.1	−11.6	26.7	29.7	4.9	−7.9
Denmark	14.1	6.0	8.1	0.4	6.5	1.2
Sweden	10.0	5.5	4.5	5.9	−1.0	−0.4
United Kingdom	8.4	−9.1	17.5	13.0	2.7	1.8
Austria	5.5	5.7	−0.2	2.1	6.1	−8.5
Ireland	3.9	−15.0	18.8	−3.3	1.6	20.5
Germany	3.5	5.4	−1.9	−4.0	−0.8	2.8
Slovak Republic	−1.0	6.3	−7.3	4.2	−18.0	6.5
Norway	−4.3	−26.4	22.1	22.1	2.1	−2.1
Luxembourg	−6.3	−10.7	4.4	−25.5	19.3	10.6
Hungary	−9.3	−18.7	9.4	4.5	−5.4	10.4
Poland	−9.5	2.5	−12.0	−11.5	−8.1	7.6
Spain	−14.1	−2.7	−11.4	−4.8	−5.4	−1.2
United States	−16.1	−14.7	−1.4	2.3	9.1	−12.9
Portugal	−33.5	23.0	−56.5	−27.0	−2.8	−26.7
Italy	−33.9	−5.5	−28.3	2.7	3.6	−34.7
Greece	−55.1	−22.1	−33.0	−4.1	−3.0	−26.0
Turkey	−75.8	−4.4	−71.5	−31.7	−17.5	−22.3
Mexico	−114.8	−10.6	−104.2	−52.7	−9.9	−41.6

Notes: Each entry shows the country's test score difference from the international mean on the PISA 2003 mathematics test, expressed in student-level standard deviations. Column 1: actual difference. Column 2: difference not accounted for by a country-level regression of the actual test score difference on the three combined input factors (family background, school resources, institutions), each of which is measured as a linear combination of individual variables using coefficient estimates from the student-level regression of Table 2, collapsed to the country level. Column 3: difference accounted for by this country-level regression. Columns 4–6: difference accounted for by family background, school resources, and institutions, respectively. By constructions, columns 2 and 3 sum to column 1, and columns 4–6 sum to column 3.

Excerpt from Woessmann (2016)