ⁱ søk3514H23

Department of economics

Examination paper for SØK3514 Applied econometrics

Examination date:08.12.2023

Examination time (from-to):09.00-14.00

Permitted examination support material: C
Permitted material:
Mathematical manual:

Knut Sydsæter, Arne Strøm og Peter Berck (2006): Matematisk formelsamling for økonomer, 4utg. Gyldendal akademiske.

Knut Sydsæter, Arne Strøm, og Peter Berck(2005): Economists' mathematical manual, Berlin.

Calculator:

- Casio FX-82CW, Casio FC100 V2, Casio fx-82ES PLUS og Casio fx-82EX
- Citizen SR-270X og Citizen SR-270X College
- Hewlett Packard HP30S

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Academic contact present at the exam location: No

OTHER INFORMATION

Get an overview of the question set before you start answering the questions.

Read the questions carefully and make your own assumptions. If a question is unclear/vague, make your own assumptions and specify them in your answer. The academic person is only contacted in case of errors or insufficiencies in the question set. Address an invigilator if you suspect errors or insufficiencies. Write down the question in advance.

Hand drawings: You can write your answers on handwritten sheets or directly in Inspera. At the bottom of the question you will find a seven-digit code. Fill in this code in the top left corner of the sheets you wish to submit. We recommend that you do this during the exam. If you require access to the codes after the examination time ends, click "Show submission".

Tablet: You can use tablet instead of handwritten sheets

Weighting: The exam consists of three different questions that are given equal weight when grading the exam.

Notifications: If there is a need to send a message to the candidates during the exam (e.g. if there is an error in the question set), this will be done by sending a notification in Inspera. A dialogue box

will appear. You can re-read the notification by clicking the bell icon in the top right-hand corner of the screen.

Withdrawing from the exam: If you become ill or wish to submit a blank test/withdraw from the exam for another reason, go to the menu in the top right-hand corner and click "Submit blank". This cannot be undone, even if the test is still open.

Access to your answers: After the exam, you can find your answers in the archive in Inspera. Be aware that it may take a working day until any hand-written material is available in the archive.

¹ Eksamen

Fill in your answer here

Words: 0

Maximum marks: 10

2 **Filopplasting**

If you have answered in word on tablet, upload your file here

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All file types are allowed. Maximum file size is **50 GB**

⌧ Select file to upload

Maximum marks: 10

Question 1. (Weight 1/3)

The article by Black et al. (2005) on the reading list investigates the relationship between high school enrollment and earnings for unskilled workers. To this end, the authors formulate the following econometric model for the relationship between enrollment in high school in a region (county) and region (county) earnings and some other control variables within the US states Kentucky and Pennsylvania.

$$(5) \qquad FrHS_{cst} = \beta_0 + \beta_1 EarnPW_{cst} + \beta_2 FrGS_{cst} + (State_s * Year_t)\beta_3 + \varepsilon_{cst}$$

where FrH_{cst} is the logarithm of the share of residents aged 15-19 enrolled in highschool. $EarnPW_{cst}$ is the logaritm of earnings per worker. $FrGS_{cst}$ is the logarithm of the share of residents aged 10-14 enrolled in grade 5-8. Subscript c, s and t denotes county, state and year, respectively. $State_s$ is a dummy for the state in which the county is located, $Year_t$ is a year dummy variable. β_1 is the coefficient of interest.

a) Give a brief interpretation of the variables in the model (5) and what type of mechanisms they might represent. Discuss econometric problems with OLS estimation of β_1 based on equation (5).

The authors show the development in real coal prices and fraction of earnings per worker in coal mining in Figure 1 and results from estimated econometric models in Table 3.

The first row in Table 3 reports results from a first differenced versions of (5) estimated by OLS. The second and third rows report results from two first differenced versions estimated with the IV/2SLS method. The Coal Price Instrument used in the second row is the first difference in log coal prices and its lag, interacted with the size of coal reserves in the county. The Coal Seam Instrument used in the third row is indicators of the amount of coal reserves in the county interacted with indicators for boom (1972-77), peak (1978-82) and bust (1982-90) periods in coal prices.

b)Explain what type of econometric challenges the estimated version reported in the first row in Table 3 is able or not able to deal with.

c) Write down the econometric model underlying the reported IV estimation in the second and third rows in Table 3. Use the information in Figure 1 to explain the IV strategy exploited in this investigation.

d)Explain what types of variation in county earnings per worker are used when estimating the relationship with the IV strategy. State explicitly the conditions required for the IV estimates in Table 3 to be given a causal interpretation. Discuss to what extent the required conditions are fulfilled in the IV-versions reported in Table 3.

e) What does the estimated coefficients in the first three columns in Table 3 tell you about the numerical relationship between high school enrollment and county earnings for unskilled workers?

Figure 1. Coal Prices and Fraction of Earnings from Mining in Kentucky and Pennsylvania, 1969-1993.
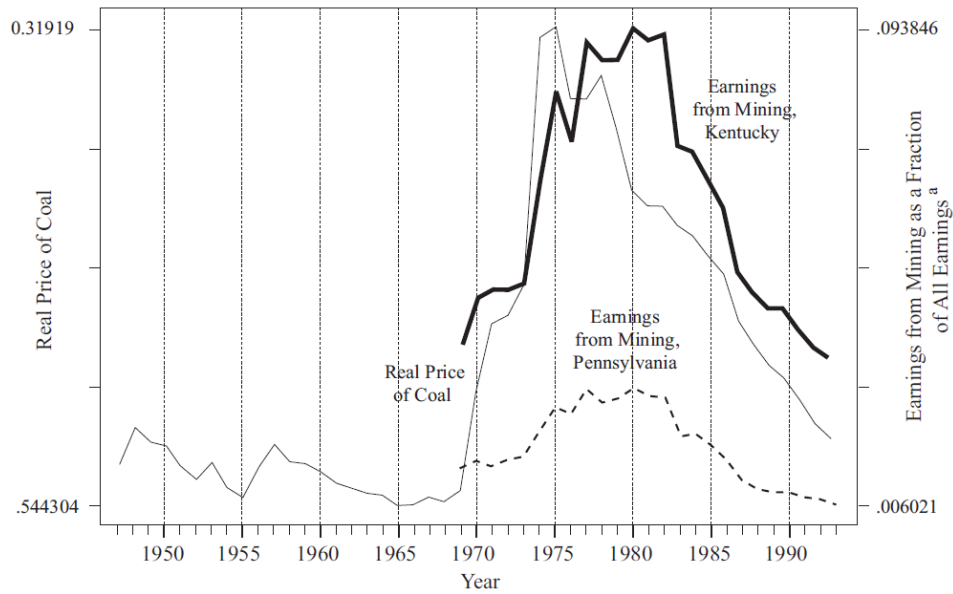

Table 3. Effect of Earnings per Worker on the
Fraction Age 15 to 19 Enrolled in High School, 1972–1990.
(Huber-White Robust Standard Errors in Parentheses; First-Stage Partial F-Statistics in Brackets)

Regression Model	Kentucky and Pennsylvania	Kentucky Only	Pennsylvania Only	Pennsylvania with MSA Counties
First-Differences	0.003	0.003	0.024	0.009
	(0.033)	(0.034)	(0.039)	(0.028)
IV Coal Price Instrument	−0.648***	−0.715***	−0.229	−0.384**
	(0.179)	(0.209)	(0.230)	(0.192)
	[22.4]	[19.4]	[12.0]	[16.3]
IV Coal Seam Instrument	−0.490***	−0.544***	−0.205	−0.220**
	(0.104)	(0.120)	(0.153)	(0.097)
	[13.3]	[12.4]	[13.0]	[7.7]
N	2,622	1,938	684	1,273

Notes: The sample consists of all non-MSA counties in Kentucky and Pennsylvania. The dependent variable is the change in the logarithm of the fraction of children ages 15 to 19 enrolled in grades 9 to 12. The table reports the coefficient on the change in the logarithm of earnings per worker. Regressions include controls for the logarithm of the fraction of children ages 10 to 14 enrolled in grades 5 to 8 and state-year effects (and an MSA dummy in column 4). The Coal Price instrument is the logarithm of the size of coal reserves multiplied by the change in the logarithm of the real price of coal and its one-year lag. The Coal Seam instrument consists of indicators for size of coal reserves (less than 100 million tons, 100 million to 1 billion tons, more than 1 billion tons) interacted with time period indicators (boom: 1972–77; peak: 1978–82; bust: 1983–90).
**Statistically significant at the .05 level; ***at the .01 level.

Question 2. (Weight 1/3)

You are hired by the government in a country to investigate the relationship between economic performance in the municipalities in the country and the wage for the mayors (ordførerne) in the municipalities. You have available a dataset with data on Y_i ,a measure of the economic performance of the municipality and W_i denoting the yearly wage rate of the mayor. Control variables are the municipal population size, POP_i, average yearly wage rate in the municipality, AW_i, the share of inhabitants with higher education, HS_i, and the share of immigrants, IMM_i.

a)Explain briefly to what extent an OLS regression between Y, W and the control variables is able to reveal the causal effect of the mayor wage on economic performance.

b)You are informed that the mayor wage partly depends on a rule relating the mayor wage to the population size in the municipality. According to the rule, mayors in municipalities above a population level of 10 000 inhabitants should be offered a minimum yearly wage of 50 000 Euros. Explain how you would design an investigation exploiting this rule and formulate explicitly the econometric model you would estimate.

c) Discuss main empirical challenges when exploiting the rule to estimate the causal effect of mayor wages on economic performance and how you would deal with these challenges.

Question 3. (Weight 1/3)

A researcher has investigated the effect of class size on student achievement in Norwegian schools by estimating a regression between individual exam results in mathematics in secondary schools in 2002, class size in the schools and some individual and school control variables by OLS. His estimates show that students in schools with large classes perform better than students in schools with small classes. Discuss the results and to what extent you find the analysis credible and relevant.