Written Exam for the B.Sc. or M.Sc. in Economics Summer 2017

Applied Econometric Policy Evaluation

Take-home exam

June 6, 2017

This exam consists of 6 pages in total.

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. That is, if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by 'eksamen på dansk' in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

Focus on Exam Cheating
In case of presumed exam cheating, which is observed by either the examination registration of the respective study programmes, the invigilation or the course lecturer, the Head of Studies will make a preliminary inquiry into the matter, requesting a statement from the course lecturer and possibly the invigilation, too. Furthermore, the Head of Studies will interview the student. If the Head of Studies finds that there are reasonable grounds to suspect exam cheating, the issue will be reported to the Rector. In the course of the study and during examinations, the student is expected to conform to the rules and regulations governing academic integrity. Academic dishonesty includes falsification, plagiarism, failure to disclose information, and any other kind of misrepresentation of the student's own performance and results or assisting another student herewith. For example failure to indicate sources in written assignments is regarded as failure to disclose information. Attempts to cheat at examinations are dealt with in the same manner as exam cheating which has been carried through. In case of exam cheating, the following sanctions may be imposed by the Rector:

1. A warning
2. Expulsion from the examination
3. Suspension from the University for at limited period or permanent expulsion

The Faculty of Social Sciences
The Study and Examination Office
October 2006

Practical instructions for the take-home exam

Read the entire exam before you respond. Answer every question in each problem. The exam consists of four problems in total.

The exam can be answered in groups of a **maximum of 2 students**. Hand-in a single report for the entire group **and specify each group member's contribution to the report**.

You must submit a comprehensive report with relevant tables and figures. The front page of the report must use the template available at `https://eksamen.ku.dk/`. Fill in the exam numbers of all group members on the front page. The second page of the template must specify which paragraphs and/or sections of the report is answered by which group member. This page may not contain other information.

Prepare one STATA do-file generating all tables and figures that appear in your report. The program must produce tables and figures in the same order as they appear in the report. Comments should clearly indicate which table or figure appearing in the report is being produced. Make sure that the do-file can be executed without any errors. The do-file must include the exam numbers of all group members.

The report must not exceed 12 (normal) pages. This includes the main text, tables and figures in the report, but not the front page and the list summarizing each group member's contribution to the report.

For the exam in Applied Econometric Policy Evaluation, a normal page is defined as a text document with the following attributes[1]:

- A4 format
- Font size set to 12
- Line spacing set to 1.5
- Margins (left/right/top/bottom) of at least 2.5 cm

The exam ends **June 6 at 22.00 (10:00pm)**. The report and the STATA do-file must be uploaded electronically no later than 22.00 (10:00pm).

Uploading your report

Each group must hand-in only one report in total. One student hands in the report by uploading it to University of Copenhagen's Digital Exam system and then adding the rest of the group members to the hand-in. Go to the website `https://eksamen.ku.dk/` and click on 'Log in as student'. Use your regular KU login and password to enter Digital Exam. Click on 'Applied Econometric Policy Evaluation' in your assignments. On the page 'Information about the hand-in', you must add the other group member to the handed-in answer (if you are in a group). Click on 'Add member' and follow the instructions on Digital Exam to invite your fellow group members. Group members will be added to the handed-in answer as soon as they **accept** your invitation.

[1]The Study Handbook for the Economics program defines a normal page as 2,400 characters, but for this exam, a normal page is instead defined in terms of format, font size, line spacing and margins.

Next, go to 'Upload hand-in' to upload your files. Each group must upload two files:

1. The report itself must be uploaded as a PDF file. The filename must start with the letter R followed by the exam numbers of all members of the group separated by _ ("underscore").
2. The STATA do-file must be uploaded as a file in plain text format (.txt). The filename must start with the letter P followed by the exam numbers of all members of the group separated by _ ("underscore").

Use the same combination of exam numbers for both files.

> Example: A group of two members with exam numbers 72 and 174 will submit the following files:
>
> 1. R_72_174.pdf
> 2. P_72_174.txt

If needed, a free PDF converter is available at `www.pdf995.com`.

If you have problems accessing the Digital Exam system at the deadline of the take-home exam or if you have difficulties with the upload function you must e-mail your answer to `samf-fak@samf.ku.dk` within 22:30 (10:30pm). Handing in your exam answer by e-mail requires that you describe the problems and provide screen dumps that document this.

Access to data

For the take-home exam, there are several data sets available on the Digital Exam website (`https://eksamen.ku.dk/`). Follow the instructions below to pick the correct data set for your group:

1. Determine the **lowest** number among the exam numbers of the group members. Use the **last** digit of the **lowest** exam number as your "group number".

   > Example: A group of three members with exam numbers 72 and 174 will have "2" as the last digit of the lowest exam number.

2. Download the STATA file groupdataX.dta from the Digital Exam website, where X is equal to the group number.

   > Example: The group from before downloads groupdata2.dta from the Digital Exam website.

3. Download the data to your computer.
4. Open the data in STATA and execute the **describe** command to ensure the data appears operative.

If you have trouble selecting or opening the data, you can contact Søren Leth-Petersen on telephone 3532 3084 or Daniel le Maire on telephone 3532 3063 during the period 10.00am to 12.00pm on June 6.

After this, no additional help will be provided for the exam.

Introduction to the assignment:

"The wage premium of union bargaining"

One of the main objectives of workers unions is to negotiate the conditions, including wages, for workers in collective agreements. The wage gain of belonging to such an agreement is called the collective bargaining premium. For the data set considered here collective bargaining can take place when the majority of workers are members of the workers union, i.e. when at least 50% of the workers in a firm are organized. Generally, it is challenging to estimate the effect of collective bargaining on wages because union membership may be related to particular worker or firm characteristics or because workers join unions because of the prospect of gaining a collective bargaining premium.

The objective here is to estimate the wage premium of collective bargaining, i.e. the causal effect of union based wage bargaining on earnings. To do this we have data collected from the pay-roll of 1000 firms with varying degrees of union organization. The data includes information about the earnings of the workers for all the companies, as well as information about the union status of the workers. The data are collected for 2013, and each worker is only observed one time. The data only contains limited information about worker characteristics, namely age and gender. The data also includes information about total number of employees in the firm. The variables available are summarized in Table 1 below.[2]

Table 1: List of variables

Variable name	Description
id	Social security number (anonymized)
firmid	Firm ID number (anonymized)
num_emp	Number of employees in the firm
wage	Annual earnings for worker
female	Dummy taking the value 1 if the subject is a female
age	Age of employee
union	Dummy taking the value 1 if individual is member of workers union
union_frac	Fraction of employees within firm who are union members

[2]The data used for this exam are simulated

Problem 1 (10%):

1. Provide a descriptive analysis of the variables in your data using relevant summary statistics. Examples of relevant aspects to include are number of observations, number of workers per firm, gender, and age. Note that these may not be the only aspects of the data that are relevant to describe.

2. Examine whether there is the same degree of wage dispersion among workers employed by firms who are covered by collective agreements and workers employed by firms not covered. Plot the kernel densities for the two groups and display them in the same diagram. Does the conclusion depend on how far from the cut-off you delimit the sample?

Problem 2 (50%):

The rule determining whether unions are entitled to negotiate collective agreements can potentially be exploited to estimate causal effect of collective bargaining on wages. In this problem you are asked to conduct a Regression Discontinuity (RD) analysis in order to estimate this causal effect.

1. Explain how a RD design can be used for estimating the causal effect of collective bargaining on earnings and under what assumptions this design is valid

2. Make a binned scatterplot around the cut-off defined by the rule. Describe the result. Does there appear to be a wage premium associated with unionized wage bargaining?

3. Conduct RD analyses where you estimate the effect of collective bargaining on earnings. Write up and estimate each of the following models and describe the results:

   (a) A linear model using the same slope on both sides of the cut-off without other control variables.

   (b) A linear model using the same slope on both sides of the cut-off with additional relevant control variables: $female$, age, num_emp.

   (c) A linear model allowing the slope to be different to the left and to the right of the cut-off.

   (d) A linear model including polynomials in the running variable, where polynomials are allowed to be different on either side of the cut-off.

   (e) Expand the regression model from (a) to incorporate heterogenous effects of collective agreements for age and gender while still estimating the ATE.

   (f) Based on the estimated parameters what is the expected earnings difference between a 50 years old woman covered by a collective agreement and a man aged 30 who is not covered by a collective agreement? A sufficient answer includes a calculation of the expected earnings difference. Calculation of the associated standard error is not required.

Problem 3 (30%):

Specification checks

1. Examine whether the results from problem 2 are driven by nonlinearities in the running variable by using a nonparametric regression discontinuity design using a triangular kernel and conventional standard errors. Conduct the estimation separately for the following three bandwidths: 0.025, 0.05, and 0.1.

2. Examine whether the variables age, gender, and number of employees are smoothly distributed around the cut-off and conclude whether the RD design can be credibly applied to estimate the causal effect of collective agreement on earnings. Do not include control variables in the regression specification.

3. Check for manipulation of the running variable. Perform a formal test for manipulation of the running variable and illustrate graphically.

Problem 4 (10%):

Suppose a new rule regarding entitlement of unions to negotiate wages is implemented for the following year, 2014. The new rule is that now only 35 percent of the workers need to be members in order for the unions to negotiate the collective agreements. The new rule was implemented unexpectedly at the beginning of 2014. Propose a research design that exploits data from both 2013 and 2014 to credibly estimate the collective bargaining premium. Discusss the critical assumptions underlying the proposed design and describe how to potentially assess their validity.