Policy Analysis Field Exam
8:00 am – 5:00 pm
August 18, 2017
Closed notes and books.

Please answer Parts 1 & 2. They are mandatory. Then answer any one of the remaining three parts of the exam (Parts 3-5).

Part 1 (Mandatory): Econometrics (approximately 2.5 hours).
Answer both Parts I and II.

Background For more than 50 years, the United States has organized military recruitment using a set of 40 Military Entrance Processing Stations (MEPS). Each MEPS is responsible for recruitment and enlistment in a particular geographic area of the country. To enlist in the military, a young person must visit the MEPS associated with his/her residence at the time of enlistment.

In 1985, the United States Military conducted a randomized experiment to help evaluate alternative approaches to recruiting new personnel. In the experiment, the MEPS stations were randomly assigned to one of three treatment arms:

- **Treatment A: Status Quo**
- **Treatment B: Enlistment Bonus.** Recruits receive a $8000 bonus immediately after they enlist.
- **Treatment C: Exit Bonus.** Recruits will receive a $15,000 cash bonus after completing their initial term of service.

The point of the experiment was to determine which approach to recruitment was the most cost-effective way to encourage people to serve in the military.

Context Suppose that you are part of a research team that would like to repurpose the data from this experiment to study the effect of military service on later life savings decisions. Many people – including military recruitment personnel – believe that serving in the military helps people develop soft skills like *grit and discipline* that are important determinants of a wide range of successful outcomes over the life course.

One specific hypothesis is that military service gives people the disposition and skills to save more for retirement and make better financial decisions. A basic problem, of course, is that people are usually not randomly assigned to serve in the military. To make progress on the problem, your team hopes to take advantage of the military recruitment experiment to learn more about the causal effects of military service on later life savings outcomes.

Data Your group has obtained access to a large longitudinal survey that tracks a cohort of men who were 18 to 20 years old in 1985. Each wave of the survey includes standard questions about the person's demographic, economic, and family, and social situation. The early waves of the survey identify the zipcode associated with each respondent's address in 1985. The most recent wave of the survey contains a series of questions about the person's level of debt and savings in 2015. The survey also

reveals whether the person served in the US Army. By linking 1985 zipcode information with MEPS catchment zones, your table is able to determine which treatment was offered to the people in the longitudinal survey sample.

For consistency please refer to the following variables in your answer below, adding in subscripts where appropriate:

Savings: Savings in 2015

Served: Dummy for serving in the military in 1985

TreatmentA, TreatmentB, TreatmentC: Dummies for living in regions assigned to each of the treatment arms

Demographics**:** Respondent demographics

Questions

1) Set up some potential outcomes notation that helps clarify causal relationships and assumptions associated with this project. Make sure that your notation is precise enough to distinguish between the relevant units of analysis and between any relevant "design" variables. Explain how the symbols you adopt are related to observable and counterfactual quantities of interest.

2) The goal of your project is to estimate the causal effect of military service on levels of savings in 2015. One of your team members suggests that you start with an intent to treat (ITT) analysis. Use your notation to explain the concept of the ITT analysis in this context. Explain the assumptions required for the ITT analysis to have a causal interpretation. How many ITT comparisons are defined in this research design? Are they all equally interesting and credible? Is the ITT an unbiased estimate of the treatment effect?

3) Use your notation to outline an instrumental variables analysis of the data. Write down the first stage, reduced form, and structural equations associated with two separate analysis: one that compares the exit bonus to the status quo, and one that compares the enlistment bonus to the status quo.

4) Explain the assumptions required by the instrumental variables analysis. Explain how you might use data to test or partially validate each assumption.

5) Based on the table below, calculate the first stage effect, reduced form effect, and Wald ratios of the two analysis. Do the two analysis produce different estimates of the causal effect of military service? One of your colleagues suggests that if the two results differ then one or more of the underlying assumptions must be invalid. Another colleague says that this is not necessarily true. Explain these two perspectives. In particular, give some reasons why these two Wald Ratios might differ even if the assumptions are valid.

	MEPS in group A	MEPS in group B	MEPS in group C
2015 Savings	$15,000	$15,300	$15,100
Fraction Serving in Military	10%	12.5%	12.5%

6) One of your team members thinks it would be wise to combine the two Wald Ratios into a single "average" estimate. Explain how you might do this using a two stage least squares regression that used the full data set and information about people living in zones A, B, and C. How would you expect the estimation results to compare to what you found in part 5 and how would you interpret the results? What would be the advantages and disadvantages of this combined analysis compared to the two separate analyses?

7) Another team member thinks that combining the results is unwise because the differences across the comparisons are scientifically interesting. She suggests that the team should not only look at the C vs A and B vs A Wald Ratios. She thinks that the C vs B comparison is interesting as well. Discuss the credibility of the monotonicity assumption for each of these three options.

8) Given the randomization strategy based on processing areas, how would you calculate the standard errors for your analysis?

Part 2 (Mandatory): Program Evaluation (approximately 2.5 hours)

Program Evaluation Question

In Canada, the provincial government[1] of British Columbia is concerned that Aboriginal men and women are underrepresented in many skilled trade occupations. For the past several decades, individuals who seek to become a certified member of over 150 different skilled trades face the requirement of completing an apprenticeship that usually lasts about four years. The apprenticeship consists of both full-time work and classroom training. Apprentices receive supervision from certified journeymen with experience in the trade. Businesses that hire an apprentice are responsible for paying the apprentice's wages during training and for allowing the apprentice to leave work to complete classroom training at the relevant times. To encourage employers to contribute to the training of apprentice workers, the provincial government has historically offered a tax credit of 20% of the apprentice's wage, up to a maximum of $4,000 per year, for the first two years of the apprenticeship.

In 2003, in an effort to encourage more Aboriginal youth to enter the skilled trades, the province of British Columbia started a pilot program in 39 municipalities. The government identified these pilot municipalities on the basis of need and additional selection criteria established by an expert panel. This pilot program expanded the existing tax credit for employers hiring Aboriginal apprentices, so that employers who hire an Aboriginal apprentice may claim a tax credit of 35% of wages, up to a maximum of $6,000 per year for the first two years of the apprenticeship. In the remaining 132 municipalities not participating in the pilot, employers will continue to be eligible for the status quo tax credit. The pilot program began in 2003 and has been operating ever since in the 39 pilot municipalities.

You are part of a team of researchers trying to evaluate the effects of the Aboriginal Apprentice Tax Credit (AATC) program. Your team has access to data on every individual (i.e., all Aboriginal and non-Aboriginal individuals) who started an apprenticeship in British Columbia from 1990 to 2015. The dataset contains panel data on all apprentices, and includes information on the trade the person is studying and the person's race/ethnicity, birthdate, gender, education level, family income, and residential location. The dataset is updated annually to provide information on occupational status and income over time. The dataset also includes panel data on all registered businesses in every municipality in British Columbia, including information on geographic location as well as the number of apprentice and non-apprentice employees annually and annual revenue.

a) Write down three broad research questions that could be used to evaluate the impact of the AATC program and that can be studied using the available data. Identify the unit of analysis, the treatment and outcome variables in each question, explain why the question matters for the program, and explain why it may be difficult to isolate the causal impacts of the AATC program.

b) Lay out a quasi-experimental research design that exploits variation in the spatial and temporal roll out of the AATC program that you could use to answer <u>one</u> of the research questions

[1] Canada consists of ten provinces, which are administrative government units similar to states in the US. Several local municipal governments compose each province. For purposes of this question, you may think of municipalities as analogous to county or city governments in the US. In other words, many municipalities compose a province, and ten provinces compose the Canadian national government.

identified in section (a). Your answer should include a non-technical discussion of the intuition of your evaluation design and why it is preferred to alternative quasi-experimental designs. It should also provide a more technical discussion that includes notation that is precise enough to describe the core assumptions of your analysis and that clarifies the statistical models you'll use in the analysis.

c) Describe the key limitations of the model and quasi-experimental research design you identify in section (b). For example, consider the conditions that must be met for establishing causality in the context of your quasi-experimental design, and the circumstances under which those conditions may not be met. In other words, what are the key threats to internal validity in your proposed model? Give at least one concrete example relevant to the described program that would lead to biased results.

d) Explain the role of the strict exogeneity condition in the AATC evaluation? What types of stories or events might cast doubt on the strict exogeneity condition?

e) Modern evaluation studies often include a series of robustness checks and sensitivity analyses that are designed to partially test the key assumptions of the model. Explain which tests and sub-analysis you would pursue in the AATC evaluation. Also explain why each test is informative about the assumptions underlying the research design.

f) One of your team members is concerned about how best to perform statistical inference in the AATC evaluation. Explain how you think about statistical inference in this setting and describe an approach that you could use to estimate the standard errors of the treatment effect estimates in the models.

Part 3: Policy Analysis (approximately 2-2.5 hours). Answer both Parts A and B.

Lester Salamon has written about the tools that governments are used to implement public policies. Weimer and Vining have written extensively on the rationales for government intervention in the marketplace. Many governments across the globe have proposed or implemented large changes in government policy in the past two or three years.

A. Choose one policy change that was actually proposed or implemented by the US or some other national or state government in the past three years.
    a. Describe the status quo (original policy) as well as the policy change carefully.
    b. Describe the policy change using Salamon's tool of government framework.
    c. Describe the strengths and weaknesses of the tool(s) of government in the original and new policies.

B. Using the economic framework from Weimer and Vining, show the following GRAPHICALLY:
    a. Show how the old policy was likely to impact social welfare.
    b. Show how the new policy is likely to impact social welfare.

    You may make reasonable assumptions in part B but YOU MUST CLEARLY ARTICULATE THESE ASSUMPTIONS.

Part 4: Microeconomics for Public Policy (approximately 2-2.5 hours)

The Governor of Minnesotiana is concerned that its workforce is not sufficiently skilled for the modern economy, and is considering offering a subsidy for them to become skilled workers. The proposal has become politically contentious, with criticisms coming from many directions. The governor wants you to evaluate the validity of the concerns about her proposal.

Since you don't have much time to do the analysis, you need to simplify things, so you will assume that individuals live two periods, 0 and 1. Assume that the people of Minnesotiana do not trust banks, and so do not borrow or save. Individuals have preferences over consumption of U(C), and an intertemporal discount factor of δ.

A worker that does not engage in training will work at home and earn w_i (where this amount differs across individuals) in each of the two periods. In the absence of the program, if a worker engages in training, they train in period 0 and earn a small work-study stipend of s. In period 1, they would earn W if they work in a skilled job. (W and s are constant across all trainees.) With the program, trainees would get an additional subsidy of S while training.

Please answer the following questions for the Governor:

1) One congressman argues that this policy would be too regressive, giving benefits to people who would have made a lot of money even if they weren't trained. Is he correct?
2) A senator argues that, since some people are already training to become skilled workers, the subsidy would just be a windfall to them. Is she correct?
3) The Guild of Skilled Workers is concerned that the program will lead to decreased wages. Under what circumstances would their concern be valid?
4) A constituent is concerned that firms might not hire the newly trained workers. Are those concerns valid? Assume that firms produce output using capital, priced at v per unit, and skilled workers, who are paid W.

You should also answer the following question:

5) If you had some additional time to work on the analysis, in what ways would you alter your model to make it more realistic?

Part 5: Benefit-Cost Analysis (approximately 2-2.5 hours)

Under the Paris Agreement, the US government committed to reduce US greenhouse gas emissions by 26% to 28% (relative to 2005 levels) by 2025. Recently, President Trump announced that the United States was withdrawing from the Paris Climate Agreement. Proponents of the Agreement argue that US participation is necessary for preventing rising global temperatures, rising sea levels, and the negative impacts of global climate change (increased mortality, disease, and reduced land values in coastal areas), and that participation in the Agreement would create jobs, by increasing demand for solar, wind, and other forms of renewable clean energy sources. Opponents argue that US participation in the Agreement will have little impact on global climate change, and that the US should focus on local environmental problems like air and water pollution, rather than global concerns like climate change. Moreover, President Trump argued that participation would increase energy costs, "killing jobs" in the US fossil fuels and manufacturing sectors, hurting consumers by raising electricity prices, and reducing US economic output.

You are asked to do a cost-benefit analysis of the decision to participate or withdraw from the Paris Agreement. In this role, please answer the following questions:

Given this information, please answer the following questions:

1)
    a. Using microeconomic theory, please provide some justification for limiting greenhouse gas emissions.
    b. Is evidence of a market failure a sufficient condition for limiting greenhouse gas emissions? Explain briefly.

2) What are the main benefits of participation, and which stakeholders would gain these benefits?

3) What are the main costs of participation, and which stakeholders would incur these costs?

4)
    a. Briefly explain how it would impact your assessment of the costs and benefits of participation if you conduct your analysis for the entire world versus doing it only for the US? Would conducting the analysis only for the US make it more or less likely that you would find that participation would have positive net benefits?
    b. Because greenhouse gases remain in the atmosphere for decades, policies to reduce greenhouse gas emissions are long-term in nature. Explain how a higher or lower discount rate would affect the likelihood of finding positive net benefits from participating in the Agreement.

5) Briefly discuss how you would estimate the value of the benefits of participation. Would shadow pricing likely be needed, or are existing market prices likely to be sufficient for valuing the benefits? Would you have to use some kind of primary source valuation method (e.g., stated preference survey), or should secondary-source monetary estimates be available in the literature that you could use to monetize the benefits?

6) Briefly discuss how you would estimate the costs of participation. Would shadow pricing likely be needed, or are existing market prices likely to be sufficient for valuing the costs? Would you have to use some kind of primary source valuation method (e.g., stated preference survey), or should secondary-source monetary estimates be available in the literature that you could use to monetize the costs?

7) Due to concerns about the impact of rising energy (electricity, heating fuel, and gasoline) prices on the poor, some economists have also proposed to subsidize energy purchases by lower-income households. Explain how these subsidies would affect the net-benefit of participation on different categories of stakeholders. How will these subsidies affect the overall net-benefit of participation? Would it be better to pay the subsidies to energy producers instead of consumers?

Note: You may include a Kaldor-Hicks Tableau as part of your answer. But it is NOT required.