Policy Analysis Field Exam
8:00 am – 5:00 pm
August 19, 2016
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, 150 points total).

Context

Suppose that the Department of Transportation has begun to explore options for reforming the system it uses to set pay for its employees. Most of these employees are currently paid according to the General Schedule (GS) pay tables. The department wants to study the consequences of an alternative payment option that gives managers wider discretion in setting pay.

- Option 1: The status quo payment system. Jobs are classified into the 15 different levels on the GS scale. Pay is set using federal government pay tables that account for the GS level of the job, with small adjustments for years of service at the job level and geographical differences in cost of living.
- Option 2: The Three Tier Model. Under the three tier model, the GS levels are grouped into three bins. The first bin includes jobs with GS levels 1 through 5. The second bin includes jobs with GS levels 6 through 10. The third bin includes jobs with GS levels above 10. In the three tier model, managers are granted wider discretion in setting pay. People with tier 1 jobs could be paid anything from the lowest pay in the GS 1 level to the highest pay in the GS 5 level, for example.

The department has been pilot testing the three tier model in some branches of the department over time, with branch managers voluntarily choosing if and when to join the pilot program. At the start of the study period in 2010, none of the branches were using the three tier model. By the end of the study period in 2015 about half of the branches in the department are operating under the three tier model. So far, none of the branches have reverted back to the old model.

The department is interested in how the three tier model affects employee morale and job satisfaction, and your team has been hired to conduct an evaluation. One theory is that the Three Tier Model will lead to more unequal pay in the workplace, which might damage morale. Another theory is that the Three Tier Model may improve morale because people will be rewarded for their work.

Data

An annual survey instrument that contains employee level data on job satisfaction. Suppose that i indexes individual employees, g indexes branches of the Department of transportation, and t indexes calendar years. Y_{igt} is a dummy equal to 1 if employee i from branch g in year t reports being satisfied with their job and 0 if they report being unsatisfied. Suppose that T_{gt} is a dummy variable set to 1 if the

branch g is operating under the three tier model in year t. T_{gt} is set to zero when branches are operating under the conventional GS payment model.

B_g is a set of branch characteristics, such as branch size, median local household income, etc. These measures do not vary over time.

a. At the outset of the evaluation, the team only has access to one year of data from the most recent year, 2015, and will use this single year of data for the initial analysis. The plan is to estimate regression Equation 1:

$$Y_{ig} = T_g\beta + B_g\alpha + \epsilon_{ig}$$

One team member suggests that since the outcome is binary, this regression should be estimated with a Logit or Probit model. Another colleague believes this is unnecessary, and a Linear Probability Model would be sufficient. Describe the strengths and weaknesses of each of these two approaches.

b. For the rest of the question, assume that you plan to use linear regression to estimate the model. Describe the comparison of observations that this model is using to identify β, the coefficient on T_g. What role do the B_g variables play?

c. What would have to be true for β to be interpreted as the casual effect of the Three Tier System on job satisfaction? Give some specific examples that would threaten causal inference in this scenario, and describe whether this would lead your estimate of β to be too small or too large.

d. Now the team has obtained more data. They now have access to surveys from each year back to 2010. The data is a series of repeated cross sections. Branches can be followed over time across survey waves, but employees cannot be followed longitudinally. The team decides to make use of the full data set by estimating a fixed effects equation as in regression Equation 2:

$$Y_{igt} = T_{gt}\beta + \theta_g + \epsilon_{itg}$$

Describe the key comparison of observations that this new model is using identify β. In other words, how do the treatment and control groups change after adding fixed effects to the model? Sometimes researchers say that a particular group of people "drives" the result in a particular study. How does this focal group differ between the cross-sectional model in part a and the fixed effects regression in part d? Does the fixed effects approach solve threats to validity associated with the cross sectional regression in part a?

e. What would have to be true for β to be interpreted as the casual effect of the Three Tier System on job satisfaction in the fixed effects regression? What would be a potential threat to validity in this context? Please give a specific example that would threaten causal inference in this scenario, and describe whether this would lead your estimate of β to be too small or too large.

f. Some branches never adopt the three tier model. What role do observations from those branches play in the model in part d?

g. A team member suggests a more elaborate regression model as in regression Equation 3:

$$Y_{igt} = T_{gt}\beta + \theta_g + \delta_t + \epsilon_{igt}$$

What is the point of δ_t in this new model? Explain how this strategy changes the key assumptions in the analysis. How does this approach change the role of the branches that never adopt the three tier model?

h. One team member is concerned with how the team should calculate standard errors to be used for statistical inference. This team member points out that the treatment, T_{gt}, is at the branch level, while the level of observation is at the individual employee level. If standard errors did not take this data structure into account, how might they be misleading? Would this problem be lessened or worsened if the number of observations within groups got larger? Describe one option for adjusting the standard errors for this issue.

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

AG Health is a large health insurance firm that provides Medicaid Managed Care plans, employer based plans, and individual private plans across the country. Over the last 8 years, AG Health has been developing a weight management program for use across all of its plans. The program is called *Equilibrium* and it uses a combination of nutrition counseling and cognitive behavioral therapy in an effort to help overweight and obese patients lose weight and live healthier lifestyles. Currently, the costs of Equilibrium participation are covered by about half of AG Health's insurance plans. In network physicians may refer a patient to the Equilibrium program if he/she has a measured BMI > 30. Of course, among referred patients, participation in Equilibrium is completely voluntary. AG Health in interested in supporting an independent evaluation of the Equilibrium program. It has agreed to provide data from insurance claims, program records, and electronic medical records to support the evaluation. Together, these data sets contain very detailed information about people's geographical, demographic, and clinical characteristics. Many patients have been enrolled in AG Health plans for multiple years.

You are part of a team of researchers who will help evaluate the program. Map out an analysis plan that you think would help you evaluate the causal effects of the Equilibrium program. Your plan should be limited to making use of the already collected data from the 8 year implementation of the program. Your plan should:

- Specify a clear research design that is consistent with the information provided in the vignette. Note that there may be more than one viable research design. Choose one approach to write about.

- Clearly explain the causal effect of interest, and the research design assumptions and data requirements that are important for convincingly estimating the effect of interest. It may help to list some of the most important variables in your study and to introduce some notation for describing key quantities of interest.

- Identify important threats to the validity of the research design.

- Describe the key pieces of data analysis you will pursue to estimate the effect. Given the identified threats to validity, describe the key data analyses you will pursue that, under ideal circumstances, would allow you to establish strong internal validity using these methods. Be sure to explain why each piece of analysis is important to the overall study by linking it to a specific assumption or quantity of interest.

- Comment on the overall strength of the proposed plan with reference to internal and external validity. No plan is perfect. What are the biggest limitations of the evaluation you described in your answer?

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

Part A: You might argue that the conduct of policy analysis is changing in response to advances in technology and other disciplines. Address three of the following large scale changes and explain how these advances are transforming the ways in which policy analyses are conducted. Assess whether or not these changes are significant to the conduct and teaching or simply "much ado about nothing" (translation: not really a big deal). For each of the three changes you choose to write about, use specific examples to explain the ways in which policy analyses will change (or will not change).

(1) the advent of big data
(2) the mapping of the human genome
(3) advances in behavioral economics-"nudges"
(4) advances in brain imaging/neurosciences
(5) GIS and other geo-spatial data

Part B: The pace of technological innovation seems to be accelerating. Describe one additional change/innovation/trend that you believe will transform the conduct of policy analysis and justify your claim with examples.

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

The government of Riverton is proposing a 5 cent per bag tax on the usage of plastic bags at store checkout counters. Proponents of the tax argue that these plastic bags are littering area lakes and filling area landfills, and something needs to be done to cut back on use of the bags. By market convention, prior to the imposition of the tax, stores allowed customer to use as many bags as they wanted for free.

Since the tax has not yet been passed, your task is to use microeconomic theory to come up with some predictions of the impact that the tax will have on individual and firm behavior, and on equilibrium prices and quantities. In answering these questions, make sure that you are clear about the agents, objectives, and constraints, as well as any additional assumptions that are being made. Use whatever equations or graphs are necessary to support your answers.

To keep things relatively tractable, given the limited amount of time you have, use a static model and a partial equilibrium framework. Suppose that consumers have preferences over consumer goods, *C,* and bags, *B*, represented by *U(C,B)*. Normalize the price of consumer goods to 1.

1) What is the likely impact of the tax on consumers' demand for consumption, C, and plastic bags, B? (For this part, set up the consumer's utility maximization problem and solve for first order conditions. You can, however, additionally use graphs to explain the intuition for your answer.)

After doing some research on the costs of plastic bags, you make the assumption that the marginal cost of producing bags is constant at 2 cents per bag.

2) If you assume that the production and consumption of these bags causes no externality, under what conditions would this tax be welfare improving? Under what conditions would the tax lower welfare? Explain.

3) Under what conditions would the 5 cent tax yield the socially optimal outcome? Explain.

Suppose you assume that firms produce bags using a combination of capital, *K*, and labor, L, through the production function $B = \mu K^a L^b$

4) What conditions must α and b satisfy to be consistent with a constant marginal cost of production?

5) If stores purchased bags from manufacturers (rather than producing their own bags) in a competitive market, what impact would you expect this tax to have on the equilibrium price that stores pay for bags? Would your answer change if you do not assume that marginal costs are constant? Explain.

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

In 2012, the Obama Administration announced stringent fuel efficiency standards that require a doubling of vehicle fuel efficiency by 2025 to 54.5 miles per gallon. In other words, manufacturers would have to produce and sell cars that are more fuel efficient than what they currently produce and sell. These standards are currently being reviewed, with some expecting the standards to be lowered (i.e., requiring lower fuel efficiency).

Proponents of the standards argue that it is important to reduce CO2 and other pollutant emissions from vehicles, as well as reduce US dependence on foreign oil. Opponents argue that this will drive up automobile costs and prices, and reduce demand for automobiles because consumers do not sufficiently value fuel efficiency at this level. Proponents counter that we are better off with fewer cars on the road.

You are asked to do a cost-benefit analysis of the decision to reduce the standards or maintain them. 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 imposing fuel efficiency standards.
    b. Is evidence of a market failure a sufficient condition for imposing the standards? Explain briefly.
    c. Do all of the proponents' arguments for the standards draw on market failure? If so, briefly explain how. If not, briefly explain how these arguments should be incorporated into the cost-benefit analysis.

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

3)
    a. What are the main costs of these standards, and which stakeholders would incur these costs?
    b. Use some kind of graph to demonstrate the costs.

4) Briefly discuss how you would estimate the value of the benefits of the standards. 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?

5) Briefly discuss how you would estimate the costs of the standards. 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?

6) As part of your analysis, you are asked to indicate whether you believe that standards are the best approach for reducing pollution from automobiles, or whether there might be a better regulatory approach. Please briefly comment on this, discussing one or two alternative approaches. In each case indicate why you believe it would or would not be better than the fuel-efficiency standards.

7) Due to concerns about the impact of rising automobile prices on the poor, the Obama administration has also proposed to subsidize automobile purchases. However, due to intense lobbying from the automobile industry, the subsidies will be paid to the manufacturers rather than to consumers. Explain how these subsidies will affect the net-effect of the ban on different categories of stakeholders. How will these subsidies affect the overall net-effect of the plan? Would it be better to pay the subsidies to buyers?

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