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 all parts of Questions 1 and 2.

Suppose you are on a research team interested in studying the effects of parental time with infants on child cognitive development. The team believes that child cognitive development is determined by the following **true population model**:

$$y_i = x_i\beta_1 + m_i\beta_2 + (x_i \times m_i)\beta_3 + v_i\lambda + \epsilon_i$$

In the model, y_i is the child's performance on a cognitive assessment collected at the start of kindergarten. x_i is a dummy variable set to 1 if either parent stayed home from work for at least 12 weeks at the start of the infant's life. m_i is family income during the year before the child was born. And v_i is child's weight at birth, which is an important indicator of human health over the medium and long run.

The model is not directly estimable because the team does not have data on the birthweight variable, v_i. They do have access to rich survey data that include measures of maternal health behaviors (smoking, alcohol consumption, drug consumption), measures of parental labor supply, family income, and other demographics.

1) Stan suggests the team could use the other demographic and health behavior variables in the survey to instead estimate:
$$y_i = x_i\beta'_1 + m_i\beta'_2 + (x_i \times m_i)\beta'_3 + d_i\lambda' + \epsilon_i$$

Where d_i is a vector of other demographic variables and behavior measures. He argues that under reasonable assumptions, β'_1 should be a very good approximation to β_1.

a) Explain Stan's approach. What assumptions would have to hold for Stan's argument to be correct?

b) Do you think these assumptions are likely to hold in this case? Why or why not? Include an example of why they would or would not hold in this case.

2) Elizabeth has been doing some digging, and she has discovered that two large states have implemented paid parental leave programs that may be of interest. In the first state, families earning below $30,000 are eligible for 12 weeks of paid leave at 100% replacement pay. In the second state, families earning less than $60,000 can stay home for 12 weeks at 100% replacement pay. Elizabeth suggests the team could use the survey data from these two states to estimate the effect of staying home with an infant using a Regression Discontinuity Design. She proposes conducting two different analyses: one for families in the state with the $30,000 eligibility threshold and one for families in the state with the $60,000 threshold.

a) Write down some notation to show how the design might work in this application. Is this a fuzzy design or a sharp design? Explain your answer.

b) What assumptions would have to be satisfied for this approach to identify a causal effect of 12 weeks of parental leave? Explain whether each assumption is testable against data. If you think an assumption is testable, explain how you would implement the test using the survey data.

c) Martha suggests centering the income variable around the state specific eligibility thresholds and implementing a single analysis. She thinks this will improve statistical power and make the study easier to explain. Do you agree that poling the data will improve statistical power? Under what assumptions would you still expect to estimate a causal effect in the pooled analysis? Lay out some notation to explain how the pooled analysis would work in practice.

d) Elizabeth disagrees. "Look at the structural model", she says, "don't you think that the effects will be different in the two states?" Henry nods his head. "I see what you mean", he says. "Plus, the structural model seems to imply that compliers, always takers, and never takers all have the same treatment effect. That's neat!"

What do you make of this conversation? If you assume that the structural model above is correctly specified, what can you learn about the parameters of the structural model from the two state-specific RDDs?

e) Suppose that Henry's point about treatment effect heterogeneity across complier types is not realistic. What will the state-specific RDD studies tell you in that case?

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

From to 2005 to 2012, Big Open University (BOU) adopted an admissions policy called NoStand. When the NoStand program began, the admissions office assigned each state in the country to one of three groups. States in the Northeast were assigned to the status quo group. States in the Midwest were assigned to the No Essay group. And states in the South and the West were assigned to the No Tests group. BOU applied different admissions criteria to the students applying each of the three sets of states.

- Students who were applying from states assigned to the No Test group were not allowed to submit standardized test scores along with their applications.
- Students applying from states assigned to the No Essay group were not allowed to include an admissions essay along with their application, but they were required to submit standardized test scores.
- Students applying from states assigned to the Status Quo group were required to submit both test scores and an admissions essay.

The idea behind NoStand is that people who belong to historically underrepresented sub-populations may be discouraged from applying to BOU because they find elements of the application process costly, confusing, or intimidating. The experiment was supposed to help determine whether the university could affect the applicant pool and ultimately the student population by varying the admissions policy. From the start, critics of the program raised concerns that the program might have unintended consequences for graduation rates. Some analysts also worried that faculty might ultimately reduce the rigor of their classes in response to the change in the composition of the student population. In this case, graduation rates might not suffer. But the level of instruction at BOU would fall.

You are leading a research project designed to learn from the NoStand experiment. In principle, the university is willing to support the study by making available data on all applications, admissions, enrollments, course outcomes, and graduations from 1995 to 2017.

The project has several broad goals. The first is to understand the causal effects of the admissions criteria on the composition of the applicant pool and the population of enrolled students. A second goal is to learn about unintended consequences of the admission criteria on downstream graduation rates, and on the rigor of classes offered at the university.

a) Set up a research design that will help you answer these questions using information and assumptions that are consistent with the vignette. Start by defining the unit of analysis. Then set up notation and use it to define key variables, parameters of interest, and assumptions required to interpret the results as causal relationships. (Note that there may be more than one viable research design. Write about the design strategy that seems most convincing to you.)

b) Explain the most important threats to the validity of the study that you have proposed. Give specific examples of the kinds of events or behaviors that would damage the internal validity of your analysis. Explain how the threat to validity would affect the observed results of the study, if the threat was actually real.

c) What types of sensitivity analysis and robustness checks would you use to assess the likelihood that the important threats to validity actually mattered in the NoStand experiment? For each proposed analysis, explain how you would interpret the results of the analysis. How would you know if the test undermined or supported the research design assumptions?

d) Comment on the overall strength of the proposed plan with reference to internal and external validity. No plan is perfect. To what extent do the treatment effects estimated in your study, address the broad goals of the study, given the limitations to internal validity, external validity, and construct validity.

e) What is the biggest limitation of the evaluation plan you proposed? Could you improve the plan with additional data? What type of data would you want to obtain?

Part 3: Policy Analysis (approximately 2-2.5 hours).

After reading the short case (5 pages) on El Caño in Puerto Rico (distributed earlier, reprinted at end of exam), answer the following questions:

  a. There are a good number of valid rationales for government intervention in the private market place that were discussed in class. Give three such rationales for government intervention in the Caño Martín Peña case (attached) and explain how each reason pertains specifically to this case.

  b. When we look at a specific rationale for government intervention, a particular policy instrument may be appropriate. If you look at a different rational for government intervention, a very different policy instrument may be appropriate. Sometimes these policy interventions may be at odds with each other. (In other words, pursuing one policy intervention can conflict with pursuing a different policy intervention.)

    a. Based on the Cano Martin Pena case, select one specific rationale for government that is relevant. Describe why this rationale for government intervention is relevant in the case. Next describe one policy instrument (using Solamon's typology of policy instruments) that can address the reason why the government is intervening.

    b. Select a second rationale for government intervention in the Cano Martin Pena case. This second rationale for intervention should be in conflict with the one you chose earlier. Describe how this second rationale for government intervention is relevant in the case of the Cano. Next describe one policy instrument for addressing the rationale for government intervention.

    c. Describe the conflict for policy makers that arises in complex cases like the Cano Martin Pena. First, be specific and talk about the Cano Martin Pena conflicts.

  c. The debt of the unincorporated territory of Puerto Rica is estimated to be as high as $27 billion. The citizens of Puerto Rico cannot vote in federal elections. Hurricane Katrina devastated the island of Puerto Rico. How do these three facts impact your policy recommendations for the Cano, if at all.

  d. What to do about Caño Martín Peña has been the subject of debates and protests. In this way the debate about Caño Martín Peña is similar to debates over gun control, immigration and abortion. Why is it so difficult to find reasonable policy interventions for these issues?

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

The governor of Stansas wishes to increase the amount of economic activity in the state. To do so, he is proposing that business profits be exempt from taxation. (Currently, both business profits and wage income are subject to taxation at a flat rate of t. Under the proposal, wages would still be subject to taxation, but the tax rate on business profits would be reduced to 0.) The proposal has become politically contentious, with criticisms coming from many directions. The governor wants you to evaluate the validity of the concerns about the proposal.

Since you don't have much time to do the analysis, you need to simplify things, so you will use a static model and a partial equilibrium framework. Assume that individuals can either work as an employee at a wage of W or operate a business and earn profits in the amount of B. Further, assume that businesses in operation in the state produce one thing, x, using a combination of capital, K, and labor, L. In formulating your analysis, 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.

The governor would like to know the following:

1) Would the tax reduction lead to increased numbers of individuals choosing to operate a business?

2) A senator argues that the lower tax rate would be a windfall to existing businesses. That is, it would lower their taxes without changing their behavior. Is she correct?

3) The governor would like to make the claim that the tax cut would lead to additional hiring. Is this claim correct? Is the answer different for new and existing businesses?

4) If this proposal does not pass, what other policy might increase business activity? Use a model to show how your proposed policy would impact business activity.

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)

The State of California has recently proposed a regulation requiring all new homes to include solar panels on their roofs. These solar panels would provide electricity that homeowners could sell back to the local electric utility. Proponents argue that this will reduce the use of electricity produced from fossil fuels, thereby reducing greenhouse gas emissions, which cause global warming, as well as emissions of local air pollutants, which cause cardio-pulmonary disease and death. In addition, they point out that this will increase demand for solar panels and create new jobs for installers. Moreover, they highlight evidence that there are more people employed per unit of electricity produced from solar power than from fossil fuels. Finally, they argue that over the long term, solar panels are a good financial deal for homeowners, because by selling the electricity produced by their panels, homeowner can reduce their spending on electricity.

Opponents argue that California is already one of the most expensive housing market, and that by increasing construction cost, the new regulation will add nearly $10,000 to the price of a new home. Reflecting the high prices, many lower-income groups in California face major challenges finding affordable housing, leading to some of the highest homelessness rates in the country. In addition, some economists have opposed the idea because they argue that it is much more efficient to build a large solar farm (a large central facility of solar panels) rather than many very small sets of panels on individual homes. Also, they argue that alternative forms of regulation, such as a carbon tax or cap and trade policy, would be more cost effective. Finally, they note that the financial benefits to homeowners are largely the result of being able to sell the electricity from the panels to the utility at retail rates, which are above the marginal cost of production.

The State of California has asked you to do a cost-benefit analysis of this proposed regulation. In this role, please answer the following questions:

Using the above information, please answer the following questions:

1)
   a. Referring to the arguments by energy economists about the cost effectiveness of *solar farms vs residential solar*, briefly describe two different possible baselines you could use to conduct your CBA. Discuss how the different baselines would change your analysis.

   b. Referring to the arguments by energy economists about the cost effectiveness of *alternative policies*, briefly describe two different possible baselines you could use to conduct your CBA. Discuss how the different baselines would change your analysis.

2) Indicate how each of the following arguments for or against the proposed regulation would impact your CBA (i.e., how you would account for it in your analysis), assuming each argument is correct:
   a. Consumption of electricity produced by burning fossil fuels will decrease.
   b. Consumption of electricity produced from solar energy will increase.
   c. Greenhouse gas emissions will decrease.
   d. Death and disease from local pollutants will decrease.
   e. Demand for solar panels will increase.

      f.   Employment of solar panel installers will increase.

      g.   By selling the electricity produced by their panels, homeowners can reduce their spending on electricity.

      h.   Time and materials required to build a home will increase.

      i.   Home prices will increase.

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

3) Consider the benefits of the regulation.
   a. Provide one example of a benefit for which you would need to use shadow pricing to properly value it. Explain why shadow pricing is necessary.
   b. Briefly discuss an appropriate method for valuing this benefit.

4) Briefly discuss how you would estimate the costs of the regulation.
   a. Provide one example of a cost for which you would need to use shadow pricing to properly value it. Explain why shadow pricing is necessary.
   b. Briefly discuss an appropriate method for valuing this cost.

5) Under the current system, California households with solar panels can sell electricity back to the utility at retail rates that exceed the marginal cost of production. If these electricity prices were reduced, how, if at all would it affect your analysis?

Case: Caño Martín Peña. Historical Background

- **In the 1930s and 1940s,** migrants from rural areas moved to San Juan in search of economic opportunity. Thousands of them settled on the banks of a channel called Caño Martín Peña. They made the wetlands habitable by filling it with dirt, garbage, and debris until it became firm enough to support the makeshift homes built from salvaged wood and corrugated tin. But officially, the land was owned by the city and state; the residents were seen as squatters. The area lacked basic urban infrastructure and services — paved roads, gas and electricity, water and sewer systems, and garbage pickup.
- **In the 1950s and 1960s,** the Puerto Rican government's urban renewal program targeted some of the Caño neighborhoods, most notably El Fanguito ("The Little Mud"). By 1962, two thousand families had been relocated to housing projects elsewhere in the city. Tokío, another neighborhood, followed in the mid-1980s. The area formerly occupied by those two neighborhoods was then gentrified. It now houses banks, offices, high-priced apartments, and the Coliseo, the largest indoor arena in Puerto Rico.
- **In 1975,** legislation was passed to address the spread of informal settlements all across Puerto Rico. It provided that titles be granted for a nominal fee to those families that had been tacitly allowed to settle on public or private land. In the years that followed, the practice of giving away titles was often used for electoral purposes.
- **By 2000,** the Caño's eight neighborhoods held 7,000 structures and were home to 27,000 residents. Most still had no sewage system nor a proper garbage system, and struggled with trash accumulation and persistent flooding with polluted waters.

A Channel in Danger

Much of life in the Caño is defined by its inhabitants' relationship with the body of water that first drew them and their families to the area, a 3.75 mile long natural tidal channel in the San Juan Bay estuary system that links the Bay of San Juan in the West to the San José Lagoon in the East.

By 2000, the channel, originally a 200-400 feet wide navigable waterway, had sections that had been completely covered. These new areas were the result of deliberate landfill efforts by immigrants with government assistance, as well as sedimentation and washed-up trash. The mangroves that grew on both sides of the channel had been replaced by makeshift structures — or co-existed with them.

3,000 of the 8,000+ houses in this 550-acre area were discharging raw sewage into the water. As a result, when the channel flooded, the waters were polluted, creating an environmental and public health nightmare for the residents. In a 2002 district census, 39% of the households interviewed reported that their house, backyard or street had flooded within the past year between 1 and 20 times.

The Curse of the Caño

Other socioeconomic indicators (as of 2010):

- More than 52% of households live below the poverty level; the median household income is $14,777, compared to $22,905 in San Juan
- Almost 50% of the population age 25 or older lacks a high school diploma
- Unemployment rate stands at 21%

(Source: 2010 U.S. Census; US American Community Survey 2006-2010)

2. A Chance for Change

In 2000, former San Juan Mayor Sila María Calderón, of the liberal Partido Popular Democrático (PPD), was elected Governor of Puerto Rico. One of Calderón's major initiatives was the creation of the Oficina de Comunidades Especiales (Special Communities Office), aimed at funding infrastructure improvements in more than 600 low-income communities across the island. With a budget of $1.4 billion, the initiative also sought to foster self-management on the part of residents and community organizations.

For decades, the Puerto Rican government had been trying to tackle the Caño's environmental problems. In 2001, the island's Department of Transportation and Public Works launched a project to seek Federal funding to dredge the channel and extend a water shuttle. Three years later a new agency, the Corporación del Proyecto ENLACE del Caño Martín Peña, was created to bring it to fruition. Leading it would be Lyvia Rodríguez, a young urban planner with an interest in the intersection of environmental and community participation issues.

ENLACE took advantage of Governor Calderón's high-profile anti-poverty campaign, reframing what had been an engineering project and organizing a series of community meetings. More than 700 were held between 2002 and 2003.

The Threat of Gentrification

The fear of displacement looms large among the residents of the Caño, some of whom live just yards away from San Juan's financial district, Hato Rey, also known as "La Milla de Oro" (the Golden Mile). The skyscrapers and large sports arena occupy what was once another Caño neighborhood, Tokío, which was leveled and gentrified in 1986.

Aerial view of the Golden Mile from Caño Martín Peña
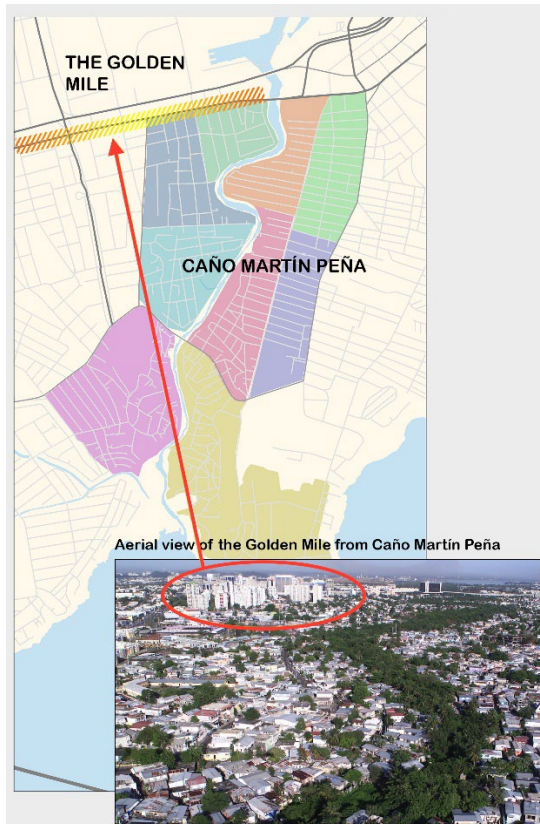
3. The Caño Community Land Trust

A Community Land Trust or CLT is a form of land ownership that has gained new popularity in the last two decades. There are now more than 250 CLTs in the U.S., and over one hundred in the United Kingdom.

The basis of the CLT model is the concept of dual ownership. The resident owns the structure, and the CLT, a non-profit corporation, owns the land on which that structure is built. The process by which a CLT acquires the land varies, but common to all CLTs is a governance structure that allows for active community participation.

In a CLT, the homeowner has user or surface rights to the land and may sell, mortgage, or bequeath his or her house. The agreement between the CLT and the homeowner includes a formula used to establish a resale price for the structure should the owner decide to sell it. The formula guarantees homeowners a fair return on their investment while preserving affordability for future owners.

For its part, the CLT can only sell or transfer construction rights to the land, but not the land itself, which it owns in perpetuity. Supporters of this model argue that it is particularly effective

in ensuring housing affordability and addressing issues such as involuntary displacement, gentrification, absentee ownership, and predatory owners.

The potential for this model to foster economic development is another claim made by its supporters, who argue that it can be used to capture appreciating land values for the benefit of the community and to promote the creation of locally owned businesses that will hire locally.

The Caño's Governance Structure

The 2004 law that formed the basis for the Caño CLT established two separate entities: the ENLACE Corporation and the CLT itself.

ENLACE's mission is to implement the Comprehensive Development Plan, which included the recommendations that came out of the extensive community meetings held during 2002-2004. ENLACE and the CLT share the same Executive Director, whose salary is paid by the former. They also share some of the staff and resources (such as databases, etc.). They have several joint committees, and their budgets, strategic plans, and 3-year work plans are aligned.

A sunset clause in the law stipulates that ENLACE will cease to exist after 25 years (extendable to 30), once the main components of the comprehensive development plan have been implemented. At that point, ENLACE will transfer all its assets to the CLT.

Working closely with ENLACE and the CLT is the G-8, a community organization that represents the eight neighborhoods that make up the Caño. The G-8 has its own regulations. Its funding comes from the quotas from member organizations, fundraising activities, and grants and private donations. It has the power to choose 2 of the 11 trustees of the CLT's board, and to organize the community meeting that will choose another 4.

4. Challenges to the Caño CLT

- **During the 2008 election campaign,** community leaders meet with gubernatorial candidates and elicit their commitment to support the Caño Martín Peña CLT.
- **November 2008:** Luis Fortuño is elected governor. He belongs to the Partido Nuevo Progresista (PNP), the same party as the long-time Mayor of San Juan, Jorge Santini, and José "Nuno" López, the newly elected Representative for San Juan's first district, which includes some of the Caño communities. The PNP now controls both chambers of the Puerto Rico Congress.
- **March 2009:** Rep. Nuno López introduces a bill to amend article 16 of the 2004 law that created the Caño Martín Peña CLT. Article 16 had established the transfer of government-owned lands in the Caño to ENLACE and ultimately to the CLT. Under Rep. López's amendment, Law 32, title to those lands is to revert back to the Commonwealth of Puerto Rico and the Municipality of San Juan immediately.
- **Spring of 2009:** public hearings are held and protests are staged in the Caño.
- **June 2009:** Law 32 is passed.

- **Summer 2009:** ENLACE appeals to several government agencies to return the lands to the CLT, but receives no response. The Caño CLT is thus left with practically no land.

Two Different Visions for the Caño

Uncertain Times

- **Just days after Law 32 is passed,** Mayor Santini begins to distribute dozens of land titles for a nominal $1 at staged events in the Caño.
- **Summer of 2009:** ENLACE and the G-8 community organization decide to take the case first to the U.S. District Court and then to Federal Court. Their argument relies on the Takings Clause of the Fifth Amendment, which says that the taking of private land by public agencies can only be done if there is a justifiable public purpose.
- **Fall of 2009:** the rhetoric between Mayor Santini and the legislators and activists supportive of the Caño CLT escalates. In October, during a legislative debate, Santini almost comes to blows with a Congressman from the opposition.
- **April 2010:** the U.S. Court of Appeals for the First District finds against the Caño Martín Peña CLT, stating that there can be no doubt that Law 32's transfer to public ownership is for public use because it "reflects the Commonwealth's judgment that the goals of rehabilitating and revitalizing the canal will be better served… if these agencies, rather than the Fideicomiso (CLT) and the Corporation, again hold and administer the lands in the canal area they once owned."
- **2010-2011:** Santini's campaign subsides, picking up speed again as the next electoral cycle approaches. The number of titles offered and accepted remains in dispute. To keep the case alive, ENLACE and the G-8 file for compensation for the lands taken away from the CLT.

5. The Present and the Future

A Re-Birth

- **November 2012:** the Partido Popular Democrático (PPD), the party that supports the Caño CLT, wins both the gubernatorial and the mayoral elections. Alejandro García Padilla becomes the new governor and Carmen Yulín the new mayor of San Juan.
- **January 2013:** Shortly after being sworn in, Mayor Yulín issues an executive order putting an end to the process of handing out land titles started by her predecessor.
- The San Juan municipality creates an Ad Hoc Committee to assess how many titles have been given and how many of them have been legally registered. Mayor Yulín promises to honor the latter, but claims that many were illegitimate and politically motivated.
- **August 2013:** Governor García Padilla signs into law a bill, originally drafted by the G-8, restoring the lands to the CLT. The bill attempts to shield the CLT from further political interference by stressing its "private and perpetual" character.
- **Fall of 2013:** The CLT, ENLACE, and the G-8 community organization focus on a dual strategy: raising funds to dredge the channel and relocate residents living on the margins

of the Caño; and launching the process of issuing collective land titles and surface rights to all the members of the CLT.

- **February 2016:** The Caño Martín Peña Community Land Trust wins the 2015-16 United Nations World Habitat Award, which honors projects that provide "practical and innovative solutions to current housing needs and problems, with a particular focus on decent, affordable housing."