**2019 Exam Questions, 14.771**

These questions are based on a slightly different syllabus, so some are not relevant.

# 1 Duflo Question

1. Hjort, Moreira, Rao and Santini collaborated with a mayor's association in Brazil and invited randomly selected mayor during a big mayor conference to an information session where they presented them with evidence of the impact of sending reminder letters to taxpayers. The session was advertised as being on the topic of how to increase local tax revenues, and was framed as a training session organized by CNM as well as researchers at Columbia and Harvard Universities. If the mayors did not attend the information session, they either went to another session or networked with their colleagues. 15 to 24 months after the conference, they called the invited and non invited mayors to ask if they had sent reminders letter. The results are as follows:

   - 37.9 percent of the mayors in the treatment group chose to attend the session. In contrast, less than 1 percent of control group mayors attended the session
   - The results on adoption of the reminder policy are in table 8

   (a) Formulate the research question that motivated this design

   (b) What is the name of this research design?

   (c) What would be an estimate effect of attending the session on changing policy. Is it large or small?

   (d) What are potential weaknesses of the research design? How would you have designed the experiment to solve them (discuss at least 2 issues).

2. Banerjee and Duflo's paper on firms ("Do firms want to borrow more?") in the syllabus runs a difference in difference specification of the form

$$y_{it} - y_{it-1} = \alpha BIG_i + \beta POST_t + \gamma BIG_i * POST_t + \epsilon_{it}, \tag{1}$$

where $y_{it} - y_{it-1}$ is a change in outcome (e.g. change in the credit limit for a firm, changes in sales).

(a) When the outcome is change in credit limit, does the coefficient $\gamma$ in this specification gives you the causal effect of the priority reform lending on amount lent to newly eligible firms. Why or why not?

(b) Using this set up, what is their estimate of credit on sales.

(c) What is the correct interpretation of this estimate?

(d) Why could be this estimate much larger than the corresponding OLS estimate.

3. Balboni et al (2019) use the data from ultra poor BRAC experiment in Bengladesh to draw the attached picture showing the mapping between wealth at t and wealth at t+1.

(a) Describe this figure. What would be the transitional dynamics of people starting at different level of wealth?

(b) Suppose the data used here only uses the treatment group. Why is there variation in $K(t)$?

(c) What could be a problem with this strategy?

(d) What is the implicit identification assumption behind the picture, and in particular behind the causal interpretation of the threshold?

(e) What would have been an ideal experiment to draw this picture?

4. Randomized waitlist (Based on Behagel and de Chaisemartin, 2019).

From the Introduction of the above paper:

"A popular design to estimate the effect of a treatment is to allocate scarce seat using a randomized waitlist. Often times, some individuals who apply for a treatment are non-takers. They decline to get treated when they receive an offer, for instance because they then realize that their benefit from treatment is lower than they thought. When a treatment is oversubscribed but some applicants are non-takers, an appealing way of allocating the available seats is to use randomized waitlists. First, applicants are ranked randomly. Then, if $S$ seats are available, an initial round of offers takes place, whereby

the first $r$ applicants get an offer. If $r$ of them decline it, a subsequent round of offers takes place whereby the next $r$ applicants get an offer. Offers stop when all the seats have been alotted This allocation method is fair: each taker has the same probability of being treated; it is also efficient: no seat for treatment remains unused, despite the presence of non-takers. Therefore, oversubscribed treatments with non-takers are often allocated by randomized waitlists. This is a popular research design, from charter school vouchers to estimation of agricultural training."

The question then is how to analyze the data from such an experiment: As applicants are ranked randomly, it may be possible to form two comparable groups with different likelihoods of getting an offer. One could then compare those two groups to estimate the effect of the treatment. In practice, researchers have used two types of comparisons. Some researchers have compared applicants getting and not getting an initial offer, thus giving rise to the so-called initial-offer (IO) estimators. Other researchers have compared applicants ever and never getting an offer, thus giving rise to the so-called ever-offer estimators

(a) Argue that the IO estimator is consistent, but not efficient: you are losing some existing information.

(b) Show (or argue intuitively) that the expected probability of taking the offer if offered has to be greater among those ever offered an offer than those who did not get an offer.

(c) What does this mean for the EO estimate?

(d) (extra credit) Suppose there are at least two seats, and strictly more takers (if offered) than seats. They show that a modified EO can be made consistent by weighting the outcome for some people before taking the difference between those who get an offer and those who don't. Provide an intuition for who should be weighted, and whether they should be weighted up or down.

## 2 Banerjee Question

**Bilateral reputation**

Suppose there is a buyer who wants one of two types of goods: red or white. Quality can be good or bad; this is observable but non-verifiable (i.e. not enforceable by court)
Payoff to Buyers: If buyer orders red: utility from good quality is $H$ and utility from bad quality is $D$. If buyer orders white: utility from good quality is $h$ and utility from bad quality is $d$. Assume $H > h > d > D$. Assume $d \geq 0$.
Costs of Suppliers: Suppliers have a cost $G$ per period of supplying the good quality and a cost of 0 of supplying the bad quality. Assume the efficient outcome is to produce high quality red, i.e. $H - G > d > h - G$.. Assume also that the supplier's outside option is getting zero for ever. Finally the supplier cannot be paid a negative price. Assume that the supplier is strategic and will do whatever maximizes his payoff.
Both buyers and suppliers are risk-neutral. The relation goes on till the supplier dies, which happens with probability $\lambda$ each period. No other discounting. Finally the buyer proposes a long-term contract at the beginning of time, and commits to it. Therefore the buyer can propose the best equilibrium from his point of view.

1. Suppose $\lambda = 1$: One-shot game:

   What is the play of the game (what contract does the buyer propose and what does the seller choose).

2. Suppose $\lambda \leq 1$

   Characterize the equilibrium the buyer will propose assuming that he wants to set a single price that does not vary over time? How will this depend on *lambda*? (Harder) Can he do better by setting prices that change over time?

3. Suppose now there are three types of sellers:

   Honest (fraction $\alpha$). Always produce high quality.

   Dishonest ($\beta$). Always produce low quality.

   Strategic ($\gamma$). Do what is in their best interest.

   The buyer does not observe the type but, as always, observes the quality delivered in equilibrium. How does this change the set of possible equilibria that the buyer will propose?

4. Suppose we observe that the sellers are paid higher prices by the same buyer as their relationship matures (i.e. as the length of the relation goes up). Is this proof that a reputation mechanism is in place? If not, what could it be?

5. Suppose we observe that sellers are paid higher prices by first-time (i.e not previous) buyers as their age (i.e. number of years they have been in business) goes up. Sketch a model to explain why this could result from a reputation mechanism.

6. Macchiavello and Morjaria find that when there is a shock to the supply of flowers in Kenya, the sellers honor their contracts with buyers with whom they have an established relation. Can you think of a reason this might be case in a reputation model and. one other reason that has nothing to do with reputation?

## 3 Olken Question

The Government of PoorCountry is interested in improving its VAT collection from retail firms. It has the idea to introduce lottery tickets, where consumers will get a lottery ticket printed on the official receipt from every retail firm based on the amount of VAT paid for each transaction. The expected payouts from the lottery are 20% of the VAT paid.
Consider a situation where the the VAT rate is 10%. Consider a good that costs $50 to manufacture, and the retailer marks it up by a further $50. So in the absence of VAT, the final retail sale price of this good would be $100. If VAT was fully paid, VAT would be $10 and the good would cost $110, and the expected value of the lottery ticket would be $2.00.
Please answer the following questions:

1. Based on existing evidence you've seen, why would the government be most concerned about VAT underpayments for the retail sector? Why not wholesale or manufacturing firms instead? Cite specific evidence, but you can be consise. [e.g. max 1 page of a blue book, and you should be able to answer with less].

2. Suppose that consumers and firms need to bargain and both agree in order for the retail firm to evade VAT. Both consumers and firms are risk neutral. There is no penalty for under-reporting as long as both consumer and firm agree to do so. Suppose that the bargaining weight of the firm is $\frac{1}{2}$, so that any surplus is split evenly between firm and the

consumer.

Consider the specific situation outlined in the second paragraph above. In the absence of the lottery tickets, what would you expect the final actual price of this good to be, inclusive of any VAT payments? How much VAT would be paid?

3. Now consider the same situation, butwith the lottery tickets. What would you expect the final price of the good to be in this case, inclusive of any VAT payments? How much VAT would be paid?

4. Consider a situation now where consumers also receive a disutility from cheating on VAT. How would this qualitatively change your answer in part (3)? You don't need to solve this piece numerically.

5. Suppose that this policy is introduced as using a randomized trial at the district level. There are 200 districts $d$, and the program is phased in over 4 years, with the lottery being introduced in $\frac{1}{4}$ of districts each year. The year of rollout is randomized (i.e. which district receives the program in which year is randomized).

   You have two datasets to work with. First, you have a 10 year panel database of VAT payments for all firms $f$ in the country that spans this rollout, where each observation is a firm-year. Second, you also have another 10 year panel database that includes all retail prices (inclusive of VAT) actually paid by consumers, where each observation is a particular purchase at firm $f$ by consumer $i$ of good type $g$.

   (a) Write the estimating equation(s) you would use to estimate the impact of the program. Describe all variables used.

   (b) Why is it useful to have the second database (prices) in addition to the VAT database? Relate your answer to the discussion above.

6. Suppose that, well before the lottery was rolled out, the people running the second dataset (the retail price one) played the following 'honesty' game with each respondent $i$. Each respondent was given a normal six sided die, told to roll it privately 10 times, and report to the survey administrators the sum of their rolls. They were paid \$0.10 times the sum of their rolls. Denote by $s_i$ the sum of the dice rolls reported by individual $i$.

(a) How might this variable help you in testing the predictions in parts (2)-(4) above?

(b) Modify your estimating equations in (5a) to use this $s_i$ variable to test some of your predictions in (6a).

**TABLE 8: POLICY-ADOPTION EXPERIMENT:**
**POLICY ADOPTION: TAX REMINDERS**

| LHS Variable | (1) Adopted | (2) Adopted | (3) Adopted | (4) Adopted | (5) Adopted |
|---|---|---|---|---|---|
| Information Session | 0.1031* | 0.1073** | 0.1011* | 0.1148 | 0.1076* |
| | (0.0531) | (0.0522) | (0.0539) | (0.0776) | (0.0649) |
| Observations | 2,271 | 2,269 | 2,054 | 912 | 1,357 |
| Respondent | All | All | All | Mayor | Finance Staff |
| Attention Check | No | No | Yes | No | No |
| Mayor Characteristics | No | Yes | Yes | Yes | Yes |
| Municipal Characteristics | No | Yes | Yes | Yes | Yes |
| Clusters (Municipalities) | 1465 | 1464 | 1412 | 912 | 1357 |
| Mean Control | 0.317 | 0.317 | 0.298 | 0.367 | 0.283 |

Notes: 2SLS estimation results. The dependent variable is a dummy which takes the value of 1 if respondent says the policy was adopted in municipality, and 0 otherwise. Information Session is a dummy which takes the value of 1 if the municipality's mayor attended the information session about tax reminders. This last variable is instrumented with treatment assignment. Attention Check refers to whether respondents that answered positively to the attention check component of the reminders policy are excluded from the model, where the attention check was "The tax reminders sent informed taxpayers that the Brazilian constitution was reformed in 1988"'. Mayors' characteristics included in the model are: Male (1/0); Age above-below median (1/0); College (1/0); 2nd Term (1/0) and Leftist Political Party (1/0, mayors belonging to a center-leftist party according to historical political platforms). Municipalities' characteristics included in the model are: Population above-below median (1/0); College Population above-below median (1/0); College Public Administration employees above-below median (1/0); Poverty above-below median (1/0); Gini above-below median (1/0); Big South (1/0, where 1 are south, southeast and mid-west regions; and 0 are north and northeast regions); monthly Per Capita Income above-below median (1/0); Local Tax Revenues share above-below median (1/0);. Robust standard errors clustered at the municipality level are in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Hjort et al (2019)

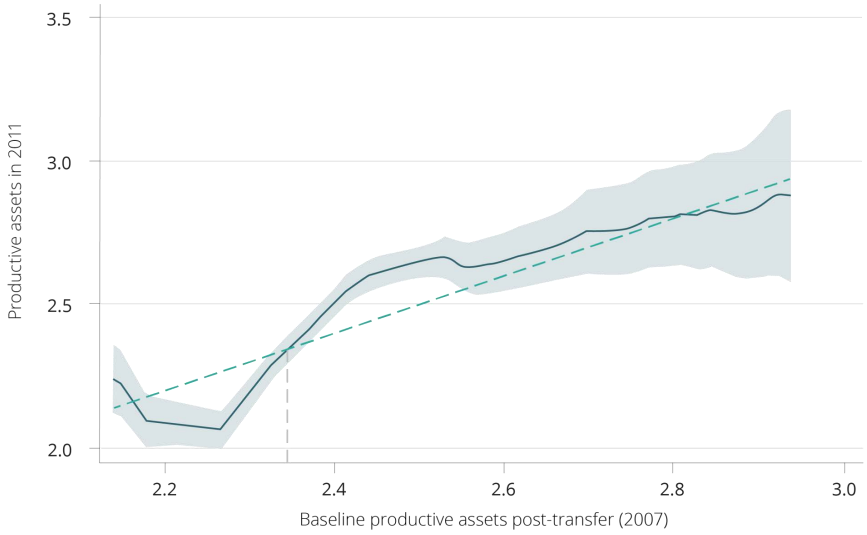


Figure 2: Balboni et al (2019)

# 14.771: Development Economics

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