Econ 131
Spring 2021
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Final Exam

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Exam Instructions:

- **Explanation should be written using pens (we recommend black or blue ink, as these often scan the best).** No pencils, except for graphs.
- **Show your work**. Credit will only be awarded on the basis of what is written on the exam.
- **Sign the academic honesty pledge**. Cheating will be dealt with harshly.

Student Name:

Student ID Number:

Affirm the academic honesty pledge below. For those writing on a non-printed copy, please just write "Academic Honesty Pledge as on exam", and sign your name.
If you do not affirm this pledge, your exam will be marked invalid.

0. ACADEMIC HONESTY PLEDGE

I confirm that I have abided by all academic honesty rules for UC Berkeley and Economics 131. I confirm that I did not see this exam before my official exam start time. I confirm that I have not shared and will not share this exam with anyone else. I confirm that I haven't copied from anybody else's exam.

Signature: _____

1. True/False/Uncertain (20 points, 2 points per question.)

Explain your answer fully based on what was discussed in class, since all the credit is based on the explanation. Your grade depends entirely on the substance of your justification, not on whether you are correct in writing "True" or "False". Note that it is possible to answer each question for full credit with three sentences or fewer, and answers longer than ten lines long will not be graded.

(a) Taxes cannot have a very large impact on labor supply of prime age workers because France has much higher taxes than the US and yet about the same work rate among prime age workers.

Solution: True that France has much higher taxes than the US and yet about the same work rate among prime age workers. This is suggestive that taxes do not have a large impact along the extensive margin but it does prove it for sure. For example, maybe France has higher labor force participation of women because it has more extensive public child care and pre-kindergarten schooling than the US. It is also still possible that taxes could have an impact on the intensive margin so just this simple piece of evidence is not conclusive.

(b) The efficiency costs of the EITC is increasing overtime as more and more individuals figure out how to game the EITC.

Solution: True: Chetty-Friedman-Saez AER'13 show that cheating of the EITC using self-employment income to maximizing the EITC refund has grown overtime. This suggests that the efficiency costs of the EITC (due to behavioral responses) increase overtime as information about the structure of the EITC diffuses.

(c) In the standard life cycle economic model, there is no need for a public retirement program like social security.

Solution: True: this is largely true as rational individual should in principle save for retirement on their own. Even in a standard model though, there might be value to provide a mandatory annuitization of life time savings (to overcome adverse selection). There can also be distributive motives to have a social security program.

(d) In the US, the elderly used to work more when there was no social security program. Therefore, the premise that people cannot work in old age and need retirement benefits is wrong.

Solution: True that the elderly used to work a lot more in the late 19th century than today (see slide from the Blundell handbook chapter). However, this does not mean that they could still support themselves as ability to work declines in old age. Hence, this does not imply that the elderly do not need retirement support.

(e) The Biden administration wants to cut CO2 emissions in the US in half by 2030 without imposing any extra tax on carbon emissions. It would be much more efficient to impose instead a carbon tax.

Solution: True in the narrow economic model where CO2 create an externality and the rest of the economy functions competitively. Two important caveats in practice. 1) new renewable energy has a strong public good component that the government should subsidize as well (the Biden plan). 2) the carbon tax is efficient but is regressive and in practice, it is difficult to compensate the losers creating backlash against them and making the carbon tax policy unworkable or unsustainable.

(f) In the US, people working at large firms pay for health insurance through reduced wages. As a result, the ordinary worker end up paying as much as the highly paid manager for health care.

Solution: True, the US mandates that large employers have to provide health care for their workers. As a result, health care is a labor cost that employers end up passing on their workers. Given that health care insurance costs are about the same for an ordinary worker and a highly paid manager, these two types of workers end up paying the same for their health care. That is a small burden for the highly paid manager but a large burden for ordinary workers (see Saez-Zucman tax burden graph including employer paid insurance).

(g) It would be foolish for the United States to introduce a wealth tax on the rich because the European experience has shown that such taxes are easy to avoid or evade.

Solution: It is true that European wealth taxes were easy to avoid (by moving abroad or taking advantage of various loopholes) or evade (using offshore accounts to hide wealth). However, a US wealth tax (such as proposed by Elizabeth Warren) could be better designed to make much harder to avoid or evade: the tax is based on citizenship (regardless of whether you move abroad), the tax has no asset class exemptions, the US has cracked down on offshore tax evasion through FATCA.

(h) The evidence from Chile showing that government student loans for high SAT scoring students increase college enrollment of high SAT students is not compelling because even absent government loans, we expect that high scoring students would be more likely to attend college anyway.

Solution: False: while it is true that high scoring students would be more likely to attend college even absent guaranteed loans, the study from Chile shows that there is a discontinuity in college attendance exactly at the score threshold where students become eligible for government student loans. Hence, the study is a very compelling regression discontinuity design.

(i) In the US, the poor get government subsidies for health care while the middle and the rich pay full cost for their health insurance (and also fund the subsidies to the poor). That is much more redistributive than the European way of providing universal health insurance paid for by taxes on everybody.

Solution: False: we've seen in class that a universal health care program paid for by taxes on everybody is economically equivalent to health care subsidized for the poor only and funded by taxes on the middle and the rich. The latter only looks more redistributive (we did a quiz on this in class).

(j) It is very difficult to fake a work disability. Therefore, we can conclude that Disability Insurance recipients would not be able to work absent the program.

Solution: False: some health conditions (such as mental health or back pain conditions) are very difficult to objectively evaluate which leaves scope for moral hazard in the DI program. Indeed, the study by Maestas-Mullen-Strand AER13 shows that applicants assigned to stringent judges are more likely to work which implies that the DI program does not an impact on work behavior through moral hazard.

2. Public Goods (20 points)

Global warming is the main challenge for the 21^{st} century. To fight global warming it is necessary worldwide effort. For simplicity assume that there are only two countries in the world, countries A and B. The two countries have identical preferences: U(x,C)=4 log X + log C, where log denotes the natural logarithm (base e), x is each country private consumption, and C is the sum of global contributions to the climate agenda. Countries A and B contribute C_a and C_b, hence $C = C_a + C_b$. Assume that $p_x = p_c = 1$ and that each country has a \$900 budget for both goods.

(a) What are the two characteristics of a pure public good? *(2 point)*

Solution: Non-rival and non-excludable.

(b) Determine the private equilibrium level of contributions for each country, C_a and C_b. *(3 point)*

Solution: Country A solves,

$$\max_{C_a} 4log(900 - C_a) + log(C_a + C_b)$$

Taking the FOC and using the symmetry of the problem ($C_a = C_b$), we find C_a=100. Hence, C_b=100.

(c) Determine the socially optimal contribution to the climate agenda, C. *(3 point)*

Solution: The social planners solves,

$$\max_{C_a, C_b} 4\log(900 - C_a) + 4\log(900 - C_b) + 2\log(C_a + C_b)$$

Taking the FOC and using the symmetry we conclude that $C_a = C_b = 180$. Hence, C=360.

(d) Why does the socially optimal quantity of contributions to the climate agenda in (c) differ from the level in (b)? *(3 point)*

Solution: Free rider problem: individuals underinvest when investment has a personal cost but a common benefit. It can also be interpreted as a good with positive externalities: the market under-supplies these goods.

(e) To assist on the global environmental issue, United Nations offers a matching grant of 25% for any contributions made by country A (C_a), or country B (C_b). Determine the private contribution levels C_a and C_b for each country under this program. *(3 point)*

Solution: The budget constraint for country A becomes: $900 = x_A + \frac{4}{5}C_A$ because now it only takes 80 cents to purchase 1 unit of contribution to the climate agenda: 80 cents is matched with 20 cents from the grant, allowing purchase of 1 full unit of C. Therefore country A solves,

$$\max_{C_a} 4\log(900 - \frac{4}{5}C_a) + log(C_a + C_b)$$

Taking the first order condition and using the symmetry we find C_a=125=C_b.

(f) Does the matching grant described in (e) affects the private equilibrium level of contributions for each country, C_a and C_b? *(3 point)*

Solution: Yes. Individual contributions move from 100 to 125.

(g) Does the matching grant described in (e) is enough to bring the private equilibrium level of contributions for each country, C_a and C_b to the socially optimal levels in (c)? *(3 point)*

Solution: No. Individual contributions under the grant is 125, while the social optimum is 180.

3. Disability Insurance (20 points)

Let's suppose that each individual in the economy earns \$200. There is no public provision of disability insurance, so they receive \$0 when sick. Let's start out assuming that there are four types of people, each with a different utility function and lifestyle-based disability probability q_i (where i indexes the different riskiness groups l, m, h, o):

- Type L: $q_l = 0.2$, $u(c) = \sqrt{c}$
- Type M: $q_m = 0.75$, $u(c) = \sqrt{c}$
- Type H: $q_h = 0.6$, $u(c) = c$
- Type O: $q_o = 0.3$, $u(c) = c^2$

Let's suppose each individual can purchase disability insurance from private firms at premium price p, providing a lump-sum benefit b if they end up disabled. For (a) and (b), we'll assume that that there is no asymmetric information; i.e. insurance companies know each consumer's type, and can offer specialized plan options to each type. There are 100 people of each type in the economy.

(a) Briefly state **and justify** whether each type would benefit from, be indifferent to, or worse off from receiving insurance at actuarially fair premiums (compared to receiving no insurance). *(2 points)*

Solution: Types L and M are risk-averse (concave utility), and thus benefit from insurance; type H is risk-neutral (linear utility) and is thus indifferent; type O is risk-seeking (convex utility) and is thus worse off.

For the rest of the problem, assume that types H and O have migrated out of the economy, so only types L and M remain. **Recall that there are 100 people of type L and 100 people of type M.**

(b) Maintaining our assumption of no asymmetric information, let's assume that private providers only offer actuarially fair plan policies with full insurance. Calculate the benefit b and price p offered to each type (note again that types H and O have migrated out of the economy, so only types L and M remain). *(2 points)*

Solution: Under full insurance, benefits must compensate the disability income drop, so $b = 200$ for both types. At actuarially fair prices, premiums must equal average cost, so $b \cdot q_i = p_i$ for $i = l, m$. Thus, $p_l = 40, p_m = 150$.

For the rest of the problem, let's relax the "no asymmetric information" assumption: instead, suppose that insurance providers cannot observe worker types.

(c) Assume that there is only one insurance company (so it may earn a profit) and it offers only one insurance plan. It offers a plan with a benefit of $b = 200$ for a price of $p = 150$. Call this insurance plan Plan #1. Which types will choose to buy it? *Hint: calculating utilities rather than maximum-prices-willing-to-pay will help you save time later. (4 points)*

Solution: Note first that the utility from buying the plan is the same across types:

$$EU_i^{insured} = (1 - q_i)\sqrt{50} + q_i\sqrt{50} = \sqrt{50} = 7.07$$

Type L's utility from receiving no insurance is:

$$EU_l^{uninsured} = (1 - (0.2))\sqrt{200} + (0.2)\sqrt{0} = 0.8\sqrt{200} = 11.31$$

Type M's utility from receiving no insurance is:

$$EU_m^{uninsured} = (1 - 0.75)\sqrt{200} + 0.75\sqrt{0} = 0.25\sqrt{200} = 3.53$$

Type i buys insurance if $EU_i^{insured} > EU_i^{uninsured}$; only type M buys.

(d) Will the insurance company still be able to offer Plan #1 in a perfectly competitive equilibrium? *(1 point)*

Solution: Let's check the firm's profits (since only type Ms buy, note that there are 100 of them):

$$\pi = \text{revenue} - \text{expected payouts} = 100(p - (0.75b)) = 100(150 - 150) = 0$$

So the firm makes \$0 in equilibrium, making the plan feasible for the firm.

(e) Suppose now that a single insurance firm offers Plan #2. Plan #2 has benefit b = 20. Show that the actuarially fair price for Plan #2 is 9.5 if the firm expects both types to buy it. At this price of 9.5, would both types buy this insurance or would they prefer to go without any insurance? *(2 point)*

Solution: We can apply our usual formula, noting that we need to pool the risk types together in a weighted sum to jointly compute the adverse state probability:

$$p = \frac{0.2(100) + 0.75(100)}{200} \cdot b = 9.5$$

The firm will charge \$9.5 for Plan #2. Each type's utility for Plan #2 is:

$$EU_i^{insured,2} = (1 - q_i)\sqrt{190.5} + q_i\sqrt{10.5}$$

So

$$EU_l^{insured,2} = 0.8\sqrt{190.5} + 0.2\sqrt{10.5} \approx 11.69$$

and

$$EU_m^{insured,2} = 0.25\sqrt{190.5} + 0.75\sqrt{10.5} \approx 5.88$$

Type L gets utility 11.31 from no insurance, and 11.69 from Plan #2. They thus choose to buy Plan #2.

Type M gets utility 3.53 from no insurance, and 5.88 from Plan #2. They thus choose to buy Plan #2.

Therefore both types prefer to buy Plan #2 rather than go without insurance.

(f) Suppose now that one insurance firm offers plan #1 at price 150 and another one offers plan #2 at price 9.5 (as in the questions above). Which types will buy Plan #2, if any? Which types will buy Plan #1, if any? *(4 points)*

Solution: Type L gets utility 11.31 from no insurance, 7.07 from Plan #1, and 11.69 from Plan #2. They thus choose to buy Plan #2.

Type M gets utility 3.53 from no insurance, 7.07 from Plan #1, and 5.88 from Plan #2. They thus stick with Plan #1.

(g) Entrepreneurs learn that the insurance company offering plan #2 was making a profit. Those entrepreneurs start lots of new firms so that any firm offering a plan with benefit $b = 20$ has to set the premium equal to actual average costs. As a result, Plan #2 disappears, but there is a new plan called Plan #3 with $b = 20$ and premium p equal to the plan's actual average costs. Assume that the types who used to buy Plan #2 (computed in the previous problem) buy Plan #3 and are the only ones who buy it. What premium will Plan #3 have? *(2 point)*

Solution: From our answer in (f), we see that only type Ls buy the new plan. Their risk is 0.2, so actuarially fair premiums at $b = 20$ are:

$$p = 0.2b = 4$$

(h) Suppose that only Plan #1 and Plan #3 are offered in the economy. Which types (if any) will buy Plan #1? Which types (if any) will buy Plan #3? Which types (if any) will buy no plan? *(3 points)*

Solution: Note first that type Ls get higher consumption in both states, so they get higher utility from Plan #3 relative to Plan #2, and they continue to buy it. So it now suffices to check whether type Ms have an incentive to switch to the new plan. Their utility under Plan #3 is:

$$EU_m^{insured,3} = 0.25\sqrt{196} + 0.75\sqrt{16} \approx 6.5$$

which is still lower than their Plan #1 utility, so they continue to stick to Plan #1.