14.41/14.410 Final Exam

Fall 2017

Please read the following instructions **carefully** before you start.

- The exam consists of five problems. Please solve **all** five problems.
- You have 3 hours to complete the exam.
- The total number of available points is 177. The points for each part are rough indication of the time that part should take.
- You may use a calculator, but **not** books, notes, or other assistance during this exam.
- In order to receive full credit, you must show your work. A correct answer without any work will receive little or no credit.
- Please write **neatly**. Illegible answers will receive no credit.

Good luck!

Problem 1. Labor supply of secondary earner (45 points)

Consider a couple, Amy and Bob, with the following utility function

$$U = log(c_A + c_B) + log(l_A) + log(l_B)$$

where c_A, l_A denote Amy's consumption and leisure and c_B, l_B denote Bob's consumption and leisure. Each family member is endowed with $T = 60$ hours of time. If Amy chooses to work, she faces hourly wage w_A. If Bob chooses to work, he faces hourly wage $w_B < w_A$. Suppose the price for the consumption goods is 1. Suppose the family files tax jointly and faces flat income tax rate τ.

1. (10 points) Derive the family labor supply function h^* as function of w_A, w_B and τ. What is Bob's elasticity of labor supply with respect to wage w_B, evaluated at the optimal level of labor supply? Denote your answer as η_h^B.

2. (10 points) The birth of a new baby complicates the couple's labor supply decisions. Continuing with the setup in part 1, suppose a total of 20 hours of childcare is required. The childcare can be provided by the family (either Amy or Bob), or be outsourced to a childcare center at price c per hour. First write down the family's optimization problem and budget constraint for three possible childcare arrangements.

a. Amy works and Bob stays at home to take care of the baby.

b. Bob works and Amy stays at home to take care of the baby.

c. Both Amy and Bob work; Hire a childcare provider to take care of the baby.

Without doing any math, which arrangement do you think is the worst (in terms of maximizing family utility)? Which arrangement do you think is the best? How does your answer depend on τ and c and why?

3. (10 points) Suppose they have decided to have Bob take care of the child for t_c hours. Consider the following two proposals to assist the family in covering the cost of child care:

a. A tax change, allowing parents with total family income below a certain level $\bar{Y}$ to deduct all child care expenses from their taxes;

b. A voucher of amount $10c$, eligible for parents with total family income below a certain level $\bar{Y}$.

Write down the family's new budget constraint under each proposal. Without doing any math, explain intuitively how each proposal will affect the labor supply decision. Which proposal would you recommend and why? Does your answer depend on the cutoff $\bar{Y}$?

4. (15 points) Your economist friend published a paper rejecting the family-utility model above. She argues that each parent values his/her own consumption and leisure, as well as the child's well-being (captured by the **total** time spent on childcare). Specifically, the utility functions of Amy and Bob are given by, respectively

$$U_A = log(c_A) + log(l_A) + log(T_A + T_B)$$

$$U_B = log(c_B) + log(l_B) + log(T_A + T_B)$$

where T_A represents the amount of time Amy devotes to childcare and T_B represents the amount of time Bob devotes to childcare.

a. Solve for the socially optimal level of $T \equiv T_A + T_B$ (i.e., the level of T that maximizes the sum of U_A and U_B) .

b. Solve for the equilibrium level of T if Amy and Bob make decisions independently. Compare your answer to part 4a and explain the difference (if any).

Problem 2. Taxation and externality (39 points)

In the market for football ticket, the demand is $Q = 50 - 3P$ where P is price (in thousand-dollars) and Q is number of ticket sold (in thousands). Suppose the supply for ticket is $Q = 2P$ until the stadium is at its full capacity of 18,000 seats.

1. (15 points) Due to the increasing number of noise complaints from residents near the stadium, the government decides watching football games imposes a negative consumption externality and taxes consumers $\frac{5}{3}$ dollars for every ticket purchased.

a. Graph the supply and demand curves and label the pre-tax market price. Why does the supply curve have the specific shape?

b. Using the pre-tax market price, calculate the burden of the tax borne by each party. (You may use either the exact formula or the elasticity-based approximation formula to calculate the tax incidence).

c. Suppose that the stadium doubles in capacity. How will your answer to part 1b change? Explain the intuition.

For the remaining parts of this question, assume the capacity of the stadium has been expanded, as in part 1c.

2. (7 points) Since football is such a wonderful game, the government wants it to be affordable to everyone. Hence, prior to implementing the tax, the government had capped the price at $P = 8$. Now, once the tax is implemented, how does the tax incidence change from part 1? Explain your answer intuitively.

3. (7 points) Football teams often threaten to move to other cities, and cities respond by spending public money on building new stadiums. Evaluate the implications of the cities' responses on local and national welfare.

4. (10 points) A new study found a strong causal relationship between brain disease and deaths of professional football players. Public health experts argue that football games impose an enormous negative externality on the players and hence should be banned altogether. Do you agree with the experts' assessment? How does your answer depend on the uncertainty of the potential health damage?

Problem 3. Student loans (41 points)

Consider a college graduate who earn income w_H if she finds a high-paying job and earn income w_L if she only finds a low-paying job. Suppose the probability of finding a high-paying job is p. Suppose she financed her college tuition bill S (in dollars) by taking out a 100% coverage tuition loan. Suppose the loan is an income-specific flat amount: she owes T_H in debt if she gets a high-paying job and T_L in debt if she gets a low-paying job.

Let $u(c)$ denotes the individual's utility from consuming c in a given state. Suppose that the government's student loan program is required to be ex-ante budget-balanced - that is, the expected amount of money collected in payments from the student must equal the overall amount of loan made to the student.

1. (4 points) Write down the government's budget constraint.

2. (4 points) Suppose that a student's consumption in a given state is equal to the wage she earns, minus the debt she pays, plus the amount of college tuition. That is, we assume that tuition payments deliver consumption value - perhaps because a higher tuition implies a more enjoyable college experience. Write down a student's expected utility.

3. (15 points) Taking college tuition bill S as given, solve for the optimal level of T_H and T_L. [Hint: the math will be easier if you work in terms of the value of tuition net of debt repayments, e.g. define $R_H = T_H - S$ and $R_L = T_L - S$.] Which is larger, T_H or T_L? Why?

4. (8 points) Now, suppose the probability of finding a high-paying job is not exogenously given. Specifically, suppose p is a function of T_L.

a. What do you think is the sign of $\frac{dp}{dT_L}$?

b. Without doing any math, explain how the optimal level of T_H and T_L will change relative to your answer to part 3.

5. (10 points) Due to a recent recession, the government's student loan program now has massive default rate. Lawmakers are debating policy proposals to decrease tuition support. The three proposals are as follows.

- No change in tuition support;
- Reducing tuition support to 80% of S;
- Reducing tuition support to 50% of S.

In addition, there are three voting blocs.

- Group A prefers less tuition support to more.
- Group B prefers the middle-ground option, followed by the status quo option.
- Group C prefers no change to the status quo, but should any change be made, they would prefer a large reduction in tuition support relative to a small reduction.

Which group's preference is single-peaked? Assuming each group accounts for 1/3 of the voters, will majority voting generate consistent outcomes? Explain why or why not.

Problem 4. True/False/Uncertain (40 points)

Decide whether the following statements are True, False, or Uncertain. Explain your reasoning. Your score will be based on on the quality of your explanation.

1. (5 points) A research study found that corporations that finance their investments with a larger ratio of debt to equity tend to pay higher rates of interest to lenders. This finding is likely due to the fact that debt-heavy firms tend to hire managerial teams who are less risk-averse.

2. (5 points) The elasticity of demand for yachts is much higher than that for cars, so the government should tax cars much more highly than yachts.

3. (5 points) The tension between equity and efficiency associated with the flat-tax proposal can be ameliorated by increasing the exemption level and the rate of the flat tax.

4. (5 points) Compare two countries that are identical except for one thing. In the first, no one wants to leave money to their kids, and any money left behind upon death is just by accident. In the second country, everyone wants to leave money to their kids, so money left behind is intentional. The estate tax should be higher in the second country than the first

5. (5 points) Raising the contribution limit for tax-subsidized retirement savings account such as IRA will likely encourage retirement saving.

6. (5 points) The empirical evidence on unemployment spell durations suggests that workers who leave unemployment earlier (that is, find or take a job sooner) have no higher post unemployment wages than do workers who leave unemployment later. Hence the time window of coverage of UI should be shortened.

7. (5 points) Economists have found that individuals' consumption declines in the first year of retirement. The lack of full consumption smoothing proves that individuals are only partially insured against leaving the labor force.

8. (5 points) The current application process for disability insurance is extremely lengthy. Rules that will make it easier for workers to apply for and receive disability benefits will be welfare-improving.

Problem 5. Short answer (12 points)

Suppose cigarette smoking imposes a negative externality of $ 1 per pack.

a. (4 points) Provide an argument for why cigarettes should be taxed at exactly $1/pack.

b. (4 points) Provide an argument for why cigarettes should be taxed at more than $1/pack.

c. (4 points) Provide an argument for why cigarettes should be taxed at less than $1/pack.

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