ARE 202, T. Fally – Problem set 3 – Of Uber and chocolate

Part A – Chocolate

To keep students happy, a professor is considering a program to subsidize chocolate for students that would offer 50% chocolate subsidy up to \$100 (i.e. a maximum subsidy of \$50). To better design this subsidy program, this professor runs a randomized experiment that lasts for a semester. He assigns students to one of two groups: i) he gives a 50% chocolate subsidy to students in the treatment group; ii) he simply monitors chocolate consumption by students during the semester.

In the control group, one observes that half of the recipients spend \$40 on chocolate and the other half (a.k.a chocolate lovers) spend \$120 on chocolate. We will assume that the students in the treatment group have the same preferences (i.e. the same proportion would have consumed \$40 and \$120 in chocolate respectively without the subsidy). The price of a chocolate tablet is \$2 (which means that the subsidized group is paying \$1 per tablet up to 50 tablets and \$2 for any extra tablet).

Questions (question 5 is more difficult):

1. For each type of students, explain using diagrams whether and why the subsidy policy may lead to lower welfare gains compared to giving the equivalent amount in cash. For which type of student is consumption distorted at equilibrium with the subsidy?

2. From now on (rest of part A), suppose that students of type i have the following preferences:

$$U_i = y + \alpha_i \log c$$

   where y is the amount of money spent on other goods (numeraire), where c is the consumption of chocolate and where α_i is a characteristic of the student (regular student vs. chocolate-loving student).

   For a given α_i, what is the demand for chocolate? What is the price elasticity of demand? Compare the Marshallian and Hicksian demand.

3. What is the amount spent on chocolate when there is no subsidy? What would be the value of α_i for each type of student to fit the data obtained from the control group?

4. Given these preferences, compute the quantity of chocolate that each type of students would consume under the subsidy treatment. How does the consumption of chocolate change for each group under the subsidy?

5* Compute the change in consumer surplus due to the chocolate subsidy for each type of student. Also compute the "deadweight loss" for each type of student. **Definition:** Here, we define the "deadweight loss" of the subsidy as the difference between the equivalent amount of money to reach the same welfare gains (equivalent variation if there is no price distortion) and the total amount of subsidy actually perceived by the student to buy chocolate.

6. Represent the "deadweight loss" graphically for each type of student after ploting the demand curve for each type of student. Note: if you cannot answer to question 5, partial credit will be given if you provide an approximation of the deadweight loss based on your graphical illustration.

Part B – Uber

Let us examine the consumer surplus from Uber rides. Suppose that a Uber ride is a homogeneous product consumed in continuous quantities x. There is also an homogeneous outside good z, such that utility for individual i can be represented by $U_i(x, z)$.

Questions:

1. Argue why it is reasonable to work with quasi-linear preferences in the case of Uber.

2. Suppose that preferences are such that demand for Uber rides is given by a iso-elastic function $D_i(p)$ of the price of Uber rides p:

$$D_i(p) = a_i p^{-\sigma}$$

   a) What is the ratio of the consumer surplus to spending on Uber rides, as a function of σ?

   b) What is that ratio if we suppose that the estimated σ is equal to about 1.5 approximatively?

   c) What issues do we encounter if $\sigma < 1$? Why is it not a relevant case?

3. Now, suppose that demand is linear: $D_i(p) = a_i(b_i - p)$

   a) What is the price elasticity of demand $\sigma_i(p)$ for individual i as a function of the price p and demand parameters a_i and b_i? How does this elasticity vary with prices p?

   b) What is the ratio of the consumer surplus to spending on Uber rides, as a function of $\sigma_i(p)$?

   c) What is that ratio if we suppose that the estimated $\sigma_i(p)$ is equal to about 1.5 approximatively? (at observed prices)

4. What explains the difference in results between the two functional forms? Conditional on estimates of price elasticities, discuss the robustness of the computation of consumer surplus to different assumptions on the shape of demand.

5. In a recent paper, Cohen, Hahn, Hall, Levitt and Metcalfe (2016) estimate the demand elasticity for Uber at $\sigma \approx 0.5$ around the 1.2 surge threshold, and always below one for higher surge thresholds (with a max x4 surge). What difficulty arises while computing the full consumer surplus in this case? How would you reinterpret their results such that they make sense?

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