

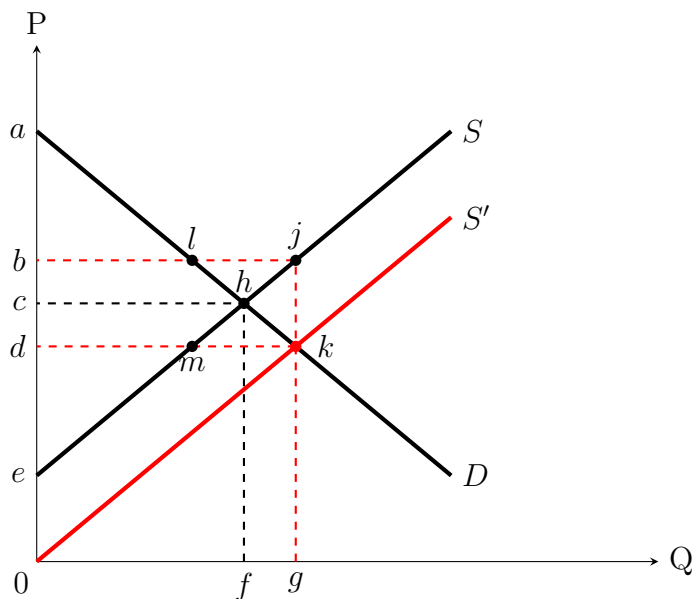
Practice Problem Set 7

180.102 Elements of Microeconomics - TA Section 03

Pinda Wang, 11 October 2024

Part I. Deadweight loss of subsidies

Let us again consider the “reverse” of taxation: subsidies. The demand equation of apples is $P = 20 - Q$, and the supply equation is $P = 4 + Q$. Suppose the government subsidizes producers \$4 for every apple sold. From the slides for TA Session Week 5, we know that the diagram with such a subsidy would look like this:



1. With the subsidy, what is the quantity sold? Answer in numbers.
2. What is the price that buyers face? What is the price that sellers actually receive into their pockets? Answer in numbers.
3. What is the consumer surplus after the subsidy? Identify the area of the consumer surplus on the diagram: for example, if you think the consumer surplus is the triangle identified by the points d, m , and e , answer “ dme ”.
4. What is the producer surplus after the subsidy? Identify the area of the producer surplus on the diagram.

5. What is the total amount of subsidies that the government is handing out? Identify the area on the diagram.
6. Is there deadweight loss due to the subsidies? If so, identify the area on the diagram. If not, explain why.

Part II. Consumer preferences

Liam consumes only 2 goods: chicken and beer.

1. On a diagram, draw Liam's budget constraint, his optimal point of consumption, and an indifference curve that passes through the optimum.
2. When the price of beer rises, what is the direction of the substitution effect for beer?
3. Suppose beer is a normal good. When the price of beer rises, what is the direction of the income effect for beer?
4. Suppose beer is an inferior good. When the price of beer rises, what is the direction of the income effect for beer?
5. Suppose beer is a Giffen good. When the price of beer rises, what is the direction of the income effect for beer? Can you say anything about the relative magnitude of the income effect versus the substitution effect?
6. Based on your answer above, determine and explain whether the following statements are true or false:
 - (a) All Giffen goods are inferior goods.
 - (b) All inferior goods are Giffen goods.

Solutions to Practice Problem Set 7

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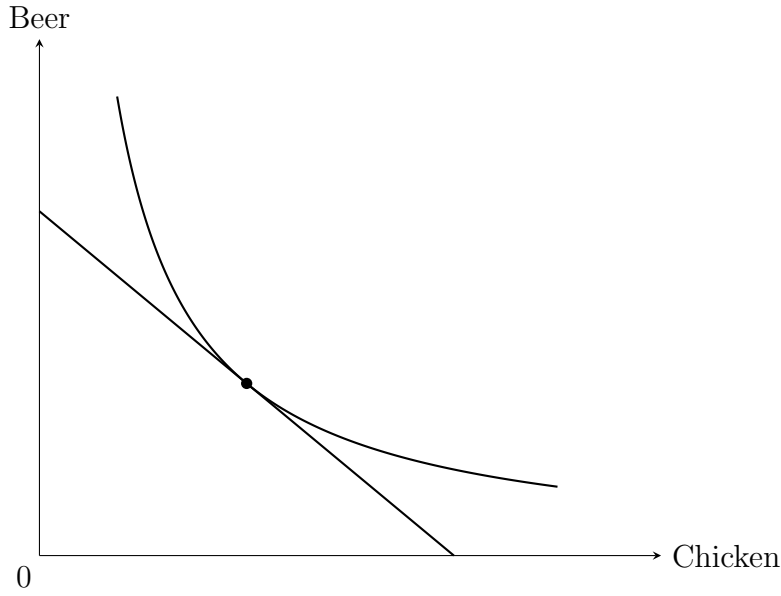
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Part I. Deadweight loss of subsidies

1. The “new” supply curve in red is given by $P = (4 + Q) - 4 = Q$. To solve for the new quantity, we have: $P = 20 - Q = Q \implies Q = 10$.
2. The price that buyers face is the price at $Q = 10$ on the demand curve: $P_d = 20 - 10 = 10$. The price that sellers face is the price at $Q = 10$ on the **old** supply curve: $P = 4 + 10 = 14$.
3. For consumers, the price corresponds to point d on the diagram, and the quantity corresponds to point g . The new “equilibrium point” for consumers is k . Naturally, consumer surplus is the triangle adk .
4. **Possible answer 1:** Producer surplus is the triangle bje . It is identified by the **old** supply curve. Notice what producer surplus means economically: it is the price that sellers receive minus their cost. A sales subsidy can be thought of as an increase in the price without any change of cost.
Possible answer 2: Producer surplus is the triangle $dk0$. It is identified by the **new** supply curve. This is correct because a sales subsidy can be equivalently considered as a decrease in cost without any change of price.
5. The total amount of subsidies is the rectangle $bdkj$. It is the per-unit amount of subsidy (bd) times the quantity (dk).
6. There is deadweight loss due to subsidies, because the gains of buyers ($cdkh$) plus the gains of sellers ($bchj$) is exceeded by the subsidy doled out by the government ($bdkj$). The area of deadweight loss, therefore, is $bdkj - cdkh - bchj = hjk$.

Part II. Consumer preferences

1. See the graph below.



2. The substitution effect for beer is negative. Substitution effect refers to the tendency that when the relative price of beer increases, consumers would buy less beer and more of the other good. Therefore, substitution effect is always negative, regardless of whether beer is a normal, inferior, or Giffen good.
3. With beer being a normal good, the income effect for beer is negative: the rise in beer price has made consumers poorer, and the demand for a normal good decreases when income decreases.
4. With beer being an inferior good, the income effect for beer is positive: the demand for an inferior good increases when income decreases.
5. With beer being a Giffen good, the income effect for beer is positive. Not only that, the size of the income effect must exceed that of the substitution effect for the total effect to be positive, i.e. a rise in beer prices results in the consumer buying more beer.
6. (a) True. As is shown in questions 4 and 5, inferiority only requires income effect to be positive with a price rise, but Giffen good requires the income effect to be strongly positive, so strong that it more than offsets the substitution effect. Therefore, Giffen goods are a subset of inferior goods.
 (b) False. See explanation above.