FE431: PUBLIC FINANCE
Fall 2006 – Professor Schmitt
Answers to Homework 2

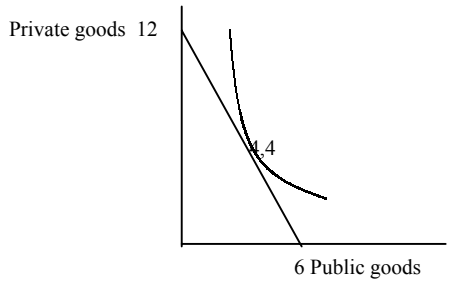
1. Chapter 3 Questions and Problems #2 page 74.

If doctors charge individuals differently, based on their ability to pay rather than the value of services rendered, these individuals will not have the same MRS between health services and all other goods. Since this is the necessary condition for exchange efficiency, such a practice of charging different prices for the same goods would reduce efficiency. Consumers who are charged higher prices will consume less health services than they would at the true price; consumers who are charged lower prices will consume more health services. Thus, the doctor has inefficiently shifted services away from those to whom she charges higher prices.

2. Chapter 3 Questions and Problems #5 page 75.

If small businesses had to pay only ½ of the payroll tax, they would effectively pay a lower price for labor than large businesses, and thus face a different price ratio. This would cause the small businesses to use an inefficiently high amount of labor. Given the different input price ratios, all firms would not have equal MRTS and production efficiency would not be met.

3. Chapter 3 Questions and Problems #7 page 75.



The maximum production of private goods is 12; of public goods is 6.
Yes, the economy can produce 5 units of the public good and 1 unit of the private good because this combination of goods falls on or below the production possibilities curve which defines all possible production bundles for the economy.
The feasible combination that maximize utility is 4 units of the private good and 4 units of the public good, because here the MRS = MRTS

4. Jim receives $20 each week and purchases only two goods, milk and chocolate. His preferences for the two goods can be described by the utility function $U^{JIM} = CM + M$, where *M* is the amount of milk he consumes (in gallons) and *C* is the amount of chocolate he consumes (in pounds). If milk costs $2 per gallon and chocolate costs $4 per pound, what combination of milk and chocolate should Joe purchase to maximize his utility? Keep in mind that Jim can purchase partial units as well. Hint: Best solved using calculus.

   Jim seeks to maximize his utility subject to his budget constraint. In calculus terms, Jim wants to

   max $U^{JIM} = CM + M$

subject to 4C+2M=20

- Solving the budget constraint for *C* yields *C=5- ½ M*
- Substituting this in for *C* in the utility function yields

$$U = M(5 - \frac{1}{2}M) + M$$

$$U = 6M - \frac{1}{2}M^2$$

- Take the derivative, set it equal to zero, and solve for *M*

$$dU / dC = 6 - M$$

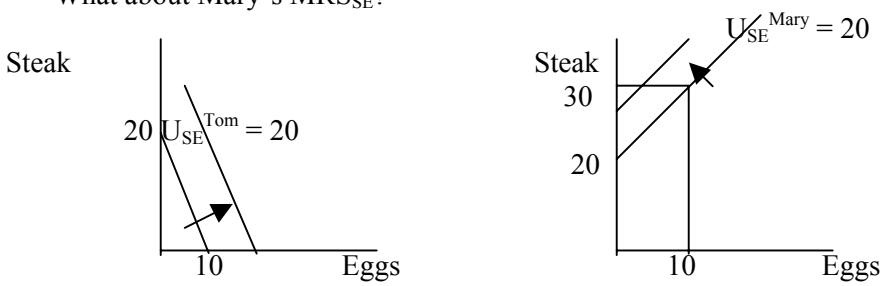
$$6 - M = 0$$

$$M^* = 6$$

- Plugging the solution for *C* into the budget constraint yields *C*=2*
- Therefore, the optimal combination of the two goods for Jim to buy each week is 2 pounds of chocolate and 6 gallons of milk.

5. Suppose an economy consists of two people, Tom and Mary. Only two goods exist in the economy, steak and eggs. Tom likes both steak and eggs. His utility function over the two goods is $U^{Tom} = S + 2E$, where *"S"* is the number of steaks Tom has and *"E"* is the number of eggs. Mary, on the other hand, likes steak but does not like eggs. Mary's utility is given by the function $U^{Mary} = S - E$.

   a. Use **two different** indifference curve diagrams to illustrate Tom and Mary's preferences over steak and eggs. Put steak on the y-axis and eggs on the x-axis. For each person, indicate two different consumption bundles that lie on an indifference curve representing *U=20*. Also, be sure to indicate the direction of increasing utility for both individuals. What can you say about Tom's MRS_{SE}? What about Mary's MRS_{SE}?

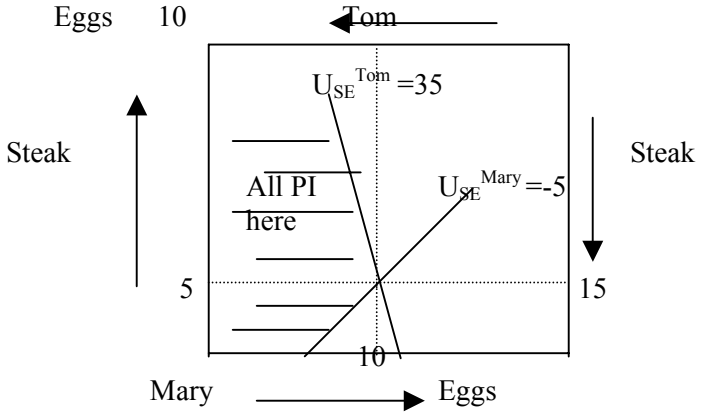


Tom's indifference curves should be straight, downward-sloping lines with a slope of –2. This implies that Tom's MRS_{SE}=2 → recall $MRS_{SE} = MU_E/MU_S = 2/1$ from the derivates (i.e. he is always willing to give up 2 steaks for 1 coconut.) Two combinations of the goods that would U=20 for Tom are 20 steaks and no eggs, or 10 eggs and no steaks. Many other combinations would also yield U=20. Tom's utility is increasing to the northeast on the graph.

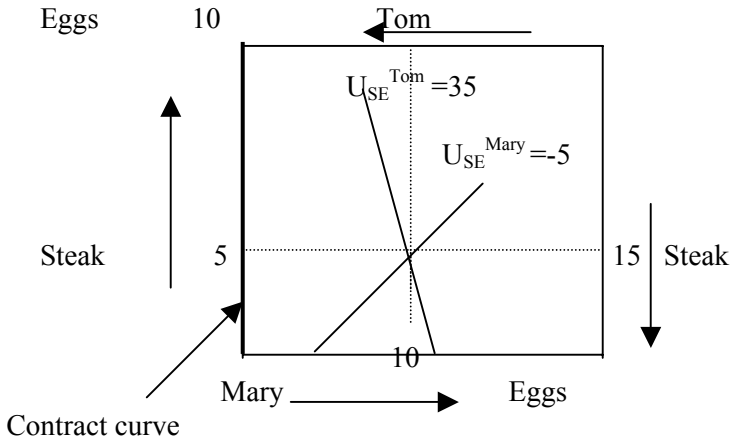
Mary's indifference curves should be straight, upward-sloping lines with a slope of 1. This implies that Mary's MRS_{SE}= -1→ recall $MRS_{SE} = MU_E/MU_S = -1/1$. Two

combinations of the goods that would U=20 for Mary are 20 steaks and 0 eggs, or 30 steaks and 10 eggs. Many other combinations would also yield U=20. Mary's utility is increasing to the northwest on the graph.

b. Now illustrate their preferences using an Edgeworth Box diagram. Make the origin for Mary be the lower left corner of the box (again, with steak on the y-axis and eggs on the x-axis). Assume the total endowment of the two goods is 20 steaks and 20 eggs, and suppose Mary is initially endowed with 5 steaks and 10 eggs and Tom is endowed with 15 steaks and 10 eggs. Indicate both the initial endowment and the area in which Pareto Improvements exist.



c. Now show the **entire** contract curve in the Edgeworth Box. Briefly explain what the contract curve looks like.



Because the utility curves are straight lines, we know that the only place $MRS_{SE}^{Mary} = MRS_{SE}^{Tom}$ will be a corner solution. The contract curve is along the left edge of the box (i.e. where Mary has no eggs). At any other point in the box, they would be able to trade so as to make at least one of them (and possibly both) better off without making the other worse off.

6. What part of the condition for Pareto Efficiency will be violated if a market is served by a monopoly rather than by many perfectly competitive firms? Explain. [Hint: Think about the steps we used to show that a perfectly competitive industry will generate a Pareto Efficient outcome. Which of the outcomes will be different under a monopoly? Will too much of the good be produced, or too little? Will the good be exchanged efficiently? Why, or why not?]

   A profit-maximizing monopoly that must charge all consumers the same price will always set price > MC. This implies that too little of the good will be produced. Using the conditions for efficiency we could show that under a monopoly

   $MRS^A = MRS^B = P > MC = MRT$

   Thus, because MRS>MRT (indicating that people place a value on additional units of this good that is higher than the cost of producing additional units), more of this good should be produced.