Problem Set Eight Solutions

Chapter 11

3. Suppose the supply curve of boom box rentals on Golden State Park is given by $P = 5 + 0.1\ Q$, where P is the daily rent per unit in dollars and Q is the number of units rented in hundreds per day. The demand curve for boom boxes is $P = 20 - 0.2\ Q$. If each boom box imposes $3 per day in noise costs on others, by how much will the equilibrium number of boom boxes rented exceed the socially optimal number?

Answer: The equilibrium quantity of boom box rentals is found by solving $5 + 0.1\ Q = 20 - 0.2\ Q$ for $Q_{pvt} = 50$ units per day. To find the socially optimal number of rentals we first find the Social MC curve by adding the $3 per unit noise cost to the Private MC curve to get Social MC = $8 + 0.1\ Q$. Equating Social MC to demand, we have $8 + 0.1\ Q = 20 - 0.2\ Q$, which solves for $Q_{soc} = 40$ units per day, or 10 less than the equilibrium number.

4. Refer to Problem 3. How would the imposition of a tax of $3 per unit on each daily boom box rental affect efficiency in this market?

Answer: Imposition of this tax would shift the Private MC curve upward by $3 per unit, making it identical to the Social MC curve. The socially optimal number of boom boxes would be rented, resulting in an overall increase in efficiency in this market.

5. Suppose the law says that Jones may not emit smoke from his factory unless he gets permission from Smith, who lives downwind. If the relevant costs and benefits of filtering the smoke from Jones's production process are as shown in the following table, and if Jones and Smith can negotiate with one another at no cost, will Jones emit smoke?

	Jones emits smoke	**Jones does not emit smoke**
Surplus for Jones	$200	$160
Surplus for Smith	400	420

Answer: The most efficient outcome is for Jones to emit smoke, because the total daily surplus in that case will be $600, compared to only $580 when Jones does not emit smoke. Since Smith has the right to insist that Jones emit no smoke, Jones will have to compensate Smith for not exercising that right. If Jones pays Smith $30, each will be $10 better off than if Smith had forced Jones not to emit smoke

6. John and Karl can live together in a two-bedroom apartment for $500 per month, or each can rent a single-bedroom apartment for $350 per month. Aside from the rent, the two would be indifferent between living together and living separately, except for one problem: John leaves dirty dishes in the sink every night. Karl would be willing to pay up to $175 per month to avoid John's dirty dishes. John, for his part, would ne willing to pay up to $225 to be able to continue his sloppiness. Should John and Karl live together? If they do, will there by dirty dishes in the sink? Explain.

Answer: John and Karl stand to save $200/mo in rental payments by living together. The lowest-cost accommodation to the dirty dish problem is for John to leave his dirty dishes in the sink. Under that arrangement, the maximum monthly rent Karl would be willing to pay to share an apartment with John is $350 - $175 = $175/mo. That amount would leave John with a remaining monthly rent bill of $325, which generates a social surplus of $25/mo. If John splits this surplus evenly with Karl, John ends up paying $337.50/mo and Karl pays $162.50. Thus both will be better off sharing.

7. How, if at all, would your answer to Problem 6 differ if John would be willing to pay up to $30 per month to avoid giving up his privacy by sharing quarters with Karl?

Answer: Adding an additional $30/mo to the cost of the shared living arrangement makes the total cost of sharing $205/mo. Because that amount exceeds the $200/mo saved by joint living, the two should live separately.

10. A village has six residents, each of whom has accumulated savings of $100. Each villager can use this money either to buy a government bond that pays 15 percent interest per year or to buy a year-old llama, send it onto the commons to graze, and sell it after one year. The price the villager gets for the 2-year-old llama depends on the quality of the fleece it grows while grazing on the commons. That in turn depends on the animal's access to grazing, which depends on the number of llamas sent to the commons, as shown in the following table:

Number of llamas on the commons	**Price per 2-year-old llama ($)**
1	122
2	118
3	116
4	114
5	112
6	109

The villagers make their investment decisions one after another, and their decisions are public.

a. If each villager decides individually how to invest, how many llamas will be sent onto the commons, and what will be the resulting total village income (from llamas and from bonds)?

Answer: The following table shows the income per llama, the village income from grazing llamas, together with the marginal village llama income. Each villager will buy a llama as long as the marginal benefit of income per llama exceeds the marginal cost of the $15 forgone by not investing the $100 in bonds. Three llamas will be sent onto the commons. The resulting total village income will be $48 from the llamas plus $45 from government bonds, or $93.

Number of llamas on the commons	**Price per 2-year-old llama ($)**	Income per llama ($/yr)	Village llama income ($/yr)	Marginal llama income ($/yr)
1	122	22	22	22
2	118	18	36	14
3	116	16	48	12
4	114	14	56	8
5	112	12	60	4
6	109	9	54	-6

b. What is the socially optimal number of llamas for this village? Why is that different from the actual number? What would be total village income be if the socially optimal number of llamas were sent to the commons?

Answer: The socially optimal number is only one llama. Villagers send three instead, because in deciding whether or not to send a llama, each villager ignores the impact of that llama's presence on the other llamas' fleece quality. The total village income at the socially optimal number of one llama is $22 from the llama and $75 from government bonds, or $97.

c. The village committee votes to auction the right to graze llamas on the commons to the highest bidder. Assuming villagers can both borrow and lend at 15 percent annual interest, how much will the right sell for at auction? How will the new owner use the right 9how many llamas will graze on the commons), and what will be the resulting total village income?

Answer: If a single villager could control access to the commons, she would send only a single llama, which she could sell after one year for $22 more than she paid for it. If the land were free, the owner would thus earn $22 per year by raising one llama per year on it, or $7 more than she would have earned had she used her $100 to buy a bond. The price of the land will be bid up until it owning the land is no better than putting the same amount in the bank at 15 percent interest. That price is the amount of money that would yield $7 per year if deposited at 15 percent interest: $46.67. The new owner will graze one llama. Total village income will be the same as in part b.