Problem Set 4: Simple Competitive Markets

The Basics

1. The market demand for lemons is \( Q_d = 100 - 4P \). The market supply is \( Q_s = 4P - 20 \).
   
a. Draw the demand curve and supply curve on the same diagram.

\[ P^* = $15, \ Q^* = 40 \]

c. What is the total consumer surplus at this price?

\[ \text{CS} = .5 \times (25-15) \times 40 = $200 \]

d. What is the total producer surplus?

\[ \text{PS} = .5 \times (15-5) \times 40 = $200 \]

e. What would be the cost to consumers in $ of a government ban on selling lemons? What would be the cost to producers? What would be the total social cost in $?

Consumers = $200, Producers = $200, Society = $400
f. Suppose that the government to support Florida farmers mandates a minimum lemon price of $20. What is the new consumer surplus and producer surplus. What happens to total surplus?

CS = .5 × (25-20) × 20 = $50 (see below)
PS = .5 × (10-5) × 20 + 10 × 20 = $50 +$200 = $250 (see below)
TS declines by $100 = area of triangle below = .5 × (20-10) × 20

f. Show on a diagram the area that corresponds to the loss of total surplus in (f).

Taxes in Competitive Markets

2. In search of a way to fund his promised income tax reduction, and in the interests of family values, Presidential candidate Mitt Romney proposes a "revenue enhancement" measure: a "fee" of $0.90 per gallon of gas. His opponent, President Obama, senses this proposal may have offended a large body of SUV owners. He would instead impose the fee only on the fat cat oil refiners.

a. Suppose demand for gas is given by Qd = 1,250-125P, and supply is given by Qs = 1,000P – 1,000, where P is in $. What is the pre-tax equilibrium price and quantity?

P* = $2, Q* = 1,000 gallons

b. If the fee of $0.90 is imposed on the consumers what is the new demand curve? What is the new equilibrium price and quantity? What is the amount of tax revenue?
c. If the fee of $0.90 is imposed on the producers what is the new supply curve? What is the new equilibrium price and quantity? What is the amount of tax revenue?

\[
\begin{align*}
\text{New } Q_d &= 1250 - 125 (F+T) = 1250 - 125P - 112.5 = 1137.5 - 125P \\
P^*_{\text{new}} &= 1.9 \\
Q^*_{\text{new}} &= 900 \\
\text{Tax Rev.} &= .9 \times 900 = 810
\end{align*}
\]

d. How much of the tax is paid by the consumer under each proposal?

Consumers pay $720 ( = $0.80\times900) of the tax burden under both proposals.

e. What is the loss of total surplus (in $) from each tax?

The loss of TS under each tax = $45 = .5 \times 0.9 \times 100 = \text{area of DL triangle}

f. Kurt Vile, fresh from an Econ 1 class, suggests that Romney should instead tax insulin, since the demand curve for insulin is inelastic at $Q_d = 900$. What is his rationale? What is the net social saving from Kurt's proposal in $?

Kurt's proposal would avoid any Deadweight Loss. The saving would be $45.

3. Suppose the city of Davis imposes a luxury tax on latte producers of $1 per latte. Assume the latte market is perfectly competitive. Suppose also demand for latte's (per hour) is given by $Q_d = 20-2P$, and supply is given by $P=2$, where $P$ is in $\$. 

(a) What is the before tax price and quantity sold (per hour)?

\[P^* = 2, \quad Q^* = 16\]

(b) What is the new price and quantity sold after the tax? How much of the tax is paid by the producers? What is the deadweight loss (per hour) from the tax?

\[P^* = 3, \quad Q^* = 14,\]

Producers bear none of the tax, consumers bear all the tax burden. The reason is that in this market the producers get no surplus. They thus cannot bear any of the tax burden.

\[
\text{Deadweight loss} = .5\times1\times2 = 1
\]
(c) The **excess burden** of a tax is the social cost (in $) of raising each dollar of tax revenue. It is thus the deadweight loss divided by the tax revenue. What is the excess burden of the $1 latte tax?

\[
\text{Revenue} = 1 \times 14
\]

\[
\text{Excess Burden} = \frac{1}{14} \approx 7\% \text{ of the tax revenue}
\]

(d) Draw a graph of tax revenue (on the vertical axis) versus the size of the tax (on the horizontal axis), showing where it intersects the axis. In the 1980s this diagram was known as the **Laffer Curve**. Notice that it implies that at some levels of taxation revenue will increase when tax rates are reduced.

The formula here from imposing a general tax of \( t \), is

\[
\text{Revenue} = \text{tax} \times \text{quantity} = 2t(8-t)
\]

**Price Floors**

4. Suppose that in San Francisco the demand for taxi rides per hour is given by \( Q_d = 120 - 5P \), while the supply is given by \( Q_s = -30 + 10P \). The market is competitive.

(a) Draw the supply curve and demand curve.
(b) What is the equilibrium price of a taxi ride, and the quantity of rides per hour?

\[ P^* = 10, \quad Q^* = 70 \]

(c) In an effort to raise drivers' incomes the city mandates a $12 minimum fare. What is the new quantity of rides?

\[ Q = 60 \]

(d) Explain why there is a rent seeking loss and the form the rent seeking loss will take.

At the higher price there is an excess supply of rides per hour of 90, compared to demand of 60. To reduce the supply to equal the demand drivers have to be spending the equivalent of $3 per ride waiting for customers.

(e) Show the area of deadweight loss from this policy on your diagram and calculate the amount per hour.

See the triangle between \( Q = 60 \) and \( Q = 70 \) in the figure above. \( \text{DWL} = (12-9) \times (70-60)/2 = $15 \)
(f) Show the area of rent seeking loss and calculate the amount.

Rent seeking loss = (12-9) × 60 = $180. On the diagram this is the bold rectangle.

(g) Explain what happens to the drivers’ producer surplus as a result of the fare rise. Is the average driver better off or worse off after the fare increase?

After taking account of the Rent Seeking Loss, the producer surplus will fall by $65 per hour. At free market equilibrium, PS = (10-3) ×70/2 = $245. With the minimum fare PS = (9-3) ×60/2 = $180.

(h) Suppose instead the Mayor limits the number of taxi licenses, so that there are only enough taxis to supply 60 rides per hour. Calculate the deadweight loss from this, the rent seeking loss, and the gains or losses in drivers’ producer surplus. Is the quota on licenses more or less effective as a way of raising drivers’ income than the price floor?

(assuming quota allocated to the drivers with the minimum cost of supply)
DL = $15
RSL = $0
PS = (12-9) ×60 + (9-3) ×60/2 = $360.
A quota is thus in the short run more effective as a way of raising drivers incomes.

(i) Suppose taxi licenses are not tradable. They have to be used by the person they were assigned to. In the long run (say 20-30 years from now) what is the deadweight loss from this, the rent seeking loss, and the gains or losses in drivers’ producer surplus.

DL = $15
RSL = $180
PS = (9-3) ×60/2 = $180.
Drivers stay in the industry who would otherwise retire or find other jobs.

(j) Suppose instead taxi licenses are tradable. They can be sold by the person they were originally issued to. Explain what happens in the long run now.

DL = $15
RSL = $0
PS = (12-9) ×60 + (9-3) ×60/2 = $360.
The recipients of the quota will sell their licences to the lowest cost producers. They will gain the full value of what would otherwise be the rent seeking loss, $180 per hour.

Price Ceilings

5. "Arugula" is a popular restaurant because the food is good and the owners, Benjamin and Sally, charge prices just high enough to cover the car payments on their Volvo. As a result there is always a long line for tables, especially on weekend nights, where the wait is typically an hour. Suppose
demand for meals at Arugula is given by \( Q_d = 100 - P \), where \( P \) is the price in $. Suppose also the supply is fixed at \( Q_s = 80 \). Benjamin and Sally, however, charge only $10 for the meal.

a. Draw a diagram of the market for meals at Arugula. What is the price at which the demand equals the supply? What is excess demand at \( P = 10 \)?

\[ \text{P}^* = 20. \text{ At } P = 10, \text{ excess demand is } 90-80 = 10. \]

b. What, in $s, is the social cost of Benjamin and Sally's good intentions? What creates this social cost?

\[ \text{Cost} = 10 \times 80 = 800 \text{ per night. Excess waiting by customer creates a cost of } 10 \text{ per meal.} \]

c. Observing the long lines of people waiting, and wishing to spare them the discomfort, Benjamin and Sally build a special waiting area with seats where they serve free wine and whole grain snacks. Explain using a diagram what the effect is of their further good intentions on the social cost of their pricing policy.
The meal cost to the customer has to be $20, the market price. If Benjamin and Sally, for example, spend $5 per customer making the wait more attractive, then the wait has to expand to equal in time the $15 surplus now being offered. One way to portray this is as a shift upwards of the demand curve by $5, the increased value of the meal. The area of rent seeking loss thus increases.

d. Kurt Vile, a rabid free marketeer and military paraphernalia enthusiast, is incensed by Benjamin and Sally's refusal to charge a higher price. He therefore takes to hanging outside Arugula on a Saturday night with a large whip flailing at the Birkenstock crowd to the snarling accompaniment of his pet Rottweiler "Maggie T." This diminishes the waiting time at Arugula to 5 minutes. Benjamin and Sally reluctantly prosecute Kurt for his activities. Kurt argues in court that his activities had no social cost. Is he correct?

YES. The waiting time still costs $10 per person, but now that it is more unpleasant it shortens.

c. Reluctantly Benjamin and Sally raise prices to the level at which demand equals supply to get rid of Kurt. Is anyone harmed by this decision? Explain.

If the value of waiting time is the same for everyone, then Benjamin and Sally benefit, and no-one loses. If some people have a lower value waiting time than the marginal customer, then these people would lose through money as opposed to time rationing.
f. Troubled by the profits they are now making Benjamin and Sally celebrate the Christmas season by announcing that 9 am on December 24, 2000 they will give $100 to each of the first 100 people who ask for the money at their house. Kurt is enraged and pickets the distribution with "Maggie T" and his Boy Scout Troop. Why? Would any distribution scheme satisfy Kurt?

Most of the money will be lost as rent seeking as people line up to claim the gift. Kurt would only like random distribution of gifts.

6. In Berkeley there is a rent control ordinance. Suppose that the market demand for apartments is given by \( Q_d = 2000 - P \), where \( P \) is the monthly rent in $. Market supply is fixed at \( Q_s = 1400 \) apartments in the short-run. Rents are fixed at $400.

   a. Will there be any deadweight losses from the rent controls? Explain.

\[
P^* = $600 \text{ per apartment. At a price of $400 there will be excess demand for apartments of } 1600 - 1400 = 200. \text{ There will be not however be any DWL because this policy does not alter the quantity of apartments rented. The gain in surplus (from a lower price) to renters is equal to } 200 \times 1400 = $2800. \text{ This gain will however most likely be depleted through rent seeking behavior. See diagram below.}
\]

b. Will there be any rent seeking losses? If so, how much? Explain.
There will be rent seeking losses from two sources:

(i) People will compete for apartments, lining up early to see listings as soon as they are posted, and racing off to the renter. They will also stay in current apartments even when it is no longer the best location, or size etc., because of the difficulty of securing an apartment in a better location or getting a different sized apartment.

(ii) Landlords will reduce maintenance, even on very low cost items, since the rent is below the value, until the mandated rent equals the market value.

7. In both NYC and in India there are long lines for most government services - getting a driver's license, getting a building permit, and so on.

a. Why is waiting costly to society and what is the standard solution to the problem?

Waiting is costly because the same number of people get served each day, but at the cost of many hours of waiting. The standard solution is to increase permit and license fees to the point where \( Q_s \) equals \( Q_d \), and to use the extra money to hire more people to process the applications.
b. Why is that solution not implemented?

The problem with this solution is that it hurts those who have a very low value for their time.

c. There is now a class of people who earn their living in both New York and India by waiting in line for those who can afford to pay them. Why does the existence of these professional "waiters" create stronger arguments for the market solution to the problem?

Since the rich can hire the poor to wait for them it implies that the poor get no particular advantage from the waiting system of payment as opposed to the price system.

8. The University of California still charges well below the market price for a college degree in California. For example in 2011-12 the University of the Pacific in Stockton charged $36,390 for tuition and fees. Out of state students at Davis paid $38,001. In comparison UC Davis charged in-state students $15,123 in tuition and fees. Explain why this should create a rent seeking loss, and explain in what forms that loss will appear.

The below market fee imply that students gain a surplus from the university. This will be at least partially competed away in two forms.

(i) The administrators and the professors do not have to deliver a quality education, since if they reduce the quality all that happens is that the line of people waiting to get into the system gets shorter.

(ii) If students compete to get into the system on the basis of grades and school activities, they will devote more time to these than they would if education was charged at the market price. This competition through SAT scores and high school activities produces a social cost. Students may also pay to go to better high schools that they would otherwise choose to improve their scholastic performance.

9. The University of California, Davis sells houses in Aggie Village, close to downtown Davis, to randomly chosen faculty and staff who have not purchased a home in the private market for at least half their market value. The houses have to be sold back to the university at the purchase price increased by the cost of living index. Explain why this policy implies rent seeking losses.
Not all the gap between the market price and the university price will be competed away, but at least some will be lost in the following ways:

(1) Faculty who value the houses at less than the market value – because they are bigger than they desired, or smaller, or in the wrong part of town, or without the right size of garden - will still agree to buy them.

(2) Faculty will delay buying a house on the private market to remain eligible for a ticket in the faculty house lottery

(3) Faculty will accept a house even if they are liable under a lease for a year's rent of their current house or apartment.