

Problem Set 2

PART A: Suppose that you have a friend who is just joining the course, and wants to know what he has missed. His or her ability to understand the rest of the course, and avoid flunking, thus depends on your ability to provide concise and coherent short-paragraph explanations of no more than four normal sentences. What do you say in order to:

1) Explain why the concept of “opportunity cost” is important?

It governs what it is to people’s advantage to do. Whenever you choose to take one particular course of action, you forego the opportunity to take other courses of action instead—and forego the benefits of those courses of action. This loss of *opportunity* is a *cost*. This is the lens through which economists view human behavior. You cannot perform an economic analysis of what people do do or should do without calculating the opportunity costs of their different possible courses of action, and recommending or assuming that they pick the course of action with the lowest *opportunity cost*—with the greatest net benefit.

The difference between the price a producer receives and their opportunity cost is the surplus received by the producer.

2) Explain why the concept of “willingness to pay” is important?

It’s a form of opportunity cost—only not for production or for choosing courses of action but rather for customers choosing to buy. If the price asked is higher than a potential customer’s *willingness-to-pay* that customer will or would be advised not to purchase but to go do something else with their money.

The difference between the price a consumer is charged and their opportunity cost is the surplus received by the consumer.

3) Explain why economists teach that free competitive markets (with secure property rights, no externalities, and so on) in equilibrium are highly likely to be very good social mechanisms for societies to utilize in order to organize the production and consumption of commodities?

Because it produces the utilitarian greatest good of the greatest number. The opportunity costs to producers are the costs to society of devoting resources to producing for the particular market being studied. The willingness-to-pay of potential consumers are the benefits—at least, if we take willingness-to-pay as a good proxy for utilitarian benefits—to society of making the goods. The market maximizes the total cumulative gap between willingness-to-pay and opportunity cost—the sum of producer and consumer surplus. It (a) arrives at a scale of production that takes advantage of all possible potential win-win exchanges without overproducing commodities that cost more than they are worth; (b) assigns the task of production to those who can accomplish it most cheaply in terms of using up society’s resources; (c) rations the goods produced to those who value them the most; and (d) responds smoothly and appropriately to changes in resources, capabilities, and preferences.

4) Explain why governments’ attempts to do better than free competitive markets in equilibrium at either deciding on what quantities should be produced or for what prices things should sell are likely to be a bad idea?

If you get the price and the quantity right, you are just mimicking what the market does.

If you get the quantity too low, you are not producing enough to take advantage of all possible potential win-win exchanges.

If you get the quantity too high, you are acting like Communist Poland—engaged in value-subtracting industries, where the cost to society of the products produced exceeds their benefits.

If you get the price too high, there will be too little demand—and you will not be producing enough to take advantage of all possible potential win-win exchanges.

If you get the price too low, there will be too little supply—and you will not be producing enough to take advantage of all possible potential win-win exchanges.

5) Account for widespread suspicion—especially on the political left, but it can and definitely used to show up on the political right as well—that praise of the market system by economists is greatly overblown: why might the market not be as good a thing as economists tend to claim that it is?

First, there are all the ways that markets can go wrong—out of equilibrium, non-competitive, afflicted with externalities, and more. The market is an optimal societal planning and calculating mechanism only under conditions that are relatively stringent.

Second, even when the market goes right, it produces *what the people with the money want*. If the distribution of income and wealth does not accord with desert and societal utility, then the market will make the wrong things and give them to the wrong people.

Third, even when the market goes right and even when the distribution of income and wealth accords with desert and societal utility, the market is not *fair*. Surplus is not allocated to those who deserve it in terms of what they contribute, but rather by the very different logic of supply and demand.

PART B: 1) Let's consider the case not of a price ceiling but of a price floor: Suppose that PDC in the town of Avicenna is, as economists say, "captured" by the interests of latte producers, and they decide that the free market is unfair to those who produce lattes. Take the demand curve to be our standard example:

$$P_d = \$10 - 0.0002Q;$$

and take the supply curve to also be our perfectly-responsive example: $P_s = \$2.50$

a) Calculate the equilibrium price, quantity, consumer surplus, and producer surplus.

The supply curve is infinitely responsive: flat. The equilibrium price is therefore $P^* = \$2.50$.

The equilibrium quantity is what people demand at that price: $Q^* = 37500$.

Producer surplus is 0—that is what a perfectly-responsive perfectly-competitive supply curve gets you, or rather, doesn't get producers.

The average willingness-to-pay—the AWTP is an average of the market price and the y-axis intercept on the demand curve, so it is $\$6.25$. Consumer surplus is thus $37500 \times (\$6.25 - \$2.50) = \$140,625$

b) Now suppose that PDC imposes a price floor: nobody is allowed to sell a latte for less than $\$6$. Determine now what the quantity produced and the price will be. Calculate the consumer and producer surplus.

At a price of $\$6$ /latte, demand is 20,000. Thus:

$$P^*_{\text{price floor}=6} = \$6$$

$$Q^*_{\text{price floor}=6} = 20000$$

The average willingness to pay of consumers is $\$8$, the average of the price— $\$6$ —and the maximum willingness-to-pay of $\$10$. The average consumer thus gets $\$2$ of surplus per latte. And :

$$CS_{\text{price floor}=6} = 20000 \times \$2 = \$40,000$$

much less than $\$140,625$.

Look at the supply curve at the $Q_s=20000$ point: P_s there is the perfectly-competitive \$2.50. The average opportunity cost is thus the same as the minimum opportunity cost of \$2.50. Sell it for \$6. Produce it an opportunity cost of \$2.50. Make 20000 units. Producer surplus is:

$$PS = 20000 \times (\$6 - \$2.50) = \$70000$$

Much more than zero! Those producers who manage to make and sell for this market are ecstatic. And those who don't manage to produce and sell for this market? They haven't lost anything, because they weren't getting any surplus anyway

c) Explain, to your friend who has just joined the course, why these calculations you have done are important and interesting.

We have taken a very complicated situation, with lots of potential producers, lots of complicated technology of production, lots of potential consumers with different and wildly-varying tastes. We have taken this situation, and why have managed to boil it down and calculate:

- 1. How many lattes should be produced if you seek the utilitarian greatest good of the greatest number, which is the same as how many lattes will be produced by a competitive market in equilibrium.**
- 2. What the prevailing market price will be.**
- 3. How government intervention will change things—on net, for the worse: consumers lose the equivalent of \$100,000 in value from the government intervention, while producers only reap an extra \$70,000**

These are very powerful analytical tools that have managed to accomplish this feat of analysis. How is this not important and interesting?

d) What if PDC decides that it wants to set the price at a price that maximizes producer surplus? What price would it choose? Why do you think it would choose that price?

Here is where calculus would be useful. But we don't have calculus available. (Cue rant from Larry Summers about how 300 years ago the only people who went to high school were landlords' sons (and very rarely daughters), how determining the limits of your property was a very key thing for a landlord, how surveying was thus a key thing to know, how trigonometry is a key piece

of surveying, and how as a result high school math curriculums moved trigonometry up to the front of subjects taught—but that that was 300 years ago, only electrical engineers doing signal processing care about trigonometry now, and they want not the triangle-measure but the complex-number algebra version of it, and that the updating of the high-school math curriculum is now at least 100 years overdue.) We do have spreadsheets. And we can do an exhaustive search with a spreadsheet:

And figure out that a price of \$6.25—halfway between the MOC P_{s0} of \$2.50 and the MWTP P_{d0} of \$10 generates the most surplus for producers: \$70,312

PS2, B1d Grid Search Calculations

Quantity	Demand Price (Willingness to Pay)	Supply Price (Opportunity Cost)	Average Opportunity Cost	Producer Surplus	Parameters	
0	\$10.00	\$2.50	\$2.50	\$0.00	Max WTP	\$10.00
1250	\$9.75	\$2.50	\$2.50	\$9062.50	Dmd. Slope	0.0002
2500	\$9.50	\$2.50	\$2.50	\$17500.00	Grid element	1250
3750	\$9.25	\$2.50	\$2.50	\$25312.50	Min OC	\$2.50
5000	\$9.00	\$2.50	\$2.50	\$32500.00	Sup. Slope	0
6250	\$8.75	\$2.50	\$2.50	\$39062.50		
7500	\$8.50	\$2.50	\$2.50	\$45000.00		
8750	\$8.25	\$2.50	\$2.50	\$50312.50		
10000	\$8.00	\$2.50	\$2.50	\$55000.00		
11250	\$7.75	\$2.50	\$2.50	\$59062.50		
12500	\$7.50	\$2.50	\$2.50	\$62500.00		
13750	\$7.25	\$2.50	\$2.50	\$65312.50		
15000	\$7.00	\$2.50	\$2.50	\$67500.00		
16250	\$6.75	\$2.50	\$2.50	\$69062.50		
17500	\$6.50	\$2.50	\$2.50	\$70000.00		
18750	\$6.25	\$2.50	\$2.50	\$70312.50		
20000	\$6.00	\$2.50	\$2.50	\$70000.00		
21250	\$5.75	\$2.50	\$2.50	\$69062.50		
22500	\$5.50	\$2.50	\$2.50	\$67500.00		
23750	\$5.25	\$2.50	\$2.50	\$65312.50		
25000	\$5.00	\$2.50	\$2.50	\$62500.00		
26250	\$4.75	\$2.50	\$2.50	\$59062.50		
27500	\$4.50	\$2.50	\$2.50	\$55000.00		

e) What if PDC decides, instead, that it wants to set the price at a price that maximizes *consumer* surplus—to forbid anyone from charging more than the price it sets. What price would it choose? Why do you think it would choose that price?

The free-market equilibrium has a $P^* = \$2.50$ and a $Q^* = 37500$, with zero producer surplus. A higher price would (a) reduce the amount consumers would buy and (b) lower the wedge between average willingness-to-pay AWTP and price. Since consumer surplus is equal to the quantity times the wedge between AWTP and P, a higher price would reduce consumer surplus. And at a lower price nobody produces, so at a lower price consumer surplus is zero.

If you want to give PDC the power to draft people into the latte industry, then they should choose a quantity of 50,000 and boost production to a level at which people are about to start being willing to pay not to have to drink a latte. But if your power is to set a price, the market has—as it always does in the case of perfect responsiveness, or constant average cost—already made things as good as they possibly can be for consumers.

f) Suppose that a new political party emerges in Avicenna that claims that the free-market is anti-consumer, and uses the extraordinary high and extortionate price of lattes in the free-market equilibrium as its principal example. Do they have a case? If you think they do have a case, write one short paragraph explaining what you think their case is. If you think they do not have a case, write one short paragraph explaining to them why—in this case, at least—the free market equilibrium is not anti-consumer.

Um... No. Here they do not have a case. This is a flat supply curve—perfect-responsiveness to demand. And, when you have constant average cost—constant returns to scale—the competitive market in equilibrium is already the most pro-consumer societal planning, calculating, and organizing mechanism for government this part of the economy that can be devised.

2) Let's rerun B1) with a different supply curve: the pure rent $Q_s = 25000$ —that is, no matter what the price is, as long as it is not zero, the quantity supplied is 25000.

a) What is the opportunity cost of latte producers for all quantities demanded up to 25000? What is the opportunity cost of latte producers for quantities demanded greater than 25000?

The opportunity cost is zero for each of the first 25000 lattes, and infinity for latte 25001: you cannot make it.

b) Calculate the equilibrium price, quantity, consumer surplus, and producer surplus.

The equilibrium quantity has to be 25000. You can't make any more lattes. And there is no advantage in reduced costs to making less. The equilibrium price will be where demand is such that 25000 lattes are purchased:

$$Q^* = 25000$$

$$P^* = 5000$$

The average willingness-to-pay of consumers is halfway between the equilibrium price of \$5 and the maximum willingness-to-pay of \$10: it is \$7.50. So:

$$CS = 25000 \times (\$7.50 - \$5.00) = \$62500$$

Lattes cost producers nothing. They sell them for \$5/latte. They sell 25000 of them. This is a pure rent situation: all of the money spent by consumers is producer surplus:

$$PS = 25000 \times (\$5 - \$0) = \$125000$$

c) Now suppose that PDC imposes a price floor: nobody is allowed to sell a latte for less than \$6. Determine now what the quantity produced and the price will be. Calculate the consumer and producer surplus.

At a price floor of \$6, the number of lattes consumed will be the number for which the willingness-to-pay is \$6 or more:

$$P_{\text{price-floor}=\$6} = \$6$$

$$Q_{\text{price-floor}=\$6} = 20000$$

The AWTP is \$8, and so:

$$CS = 20000 \times (\$8 - \$6) = \$40000$$

Producers can only sell 20000 of the free lattes they have—the rest are thrown away. So:

$$PS = 20000 \times (\$6 - \$0) = \$120000$$

d) What if PDC decides that it wants to set the price at a price that maximizes producer surplus? What price would it choose? Why do you think it would choose that price?

Here is where calculus would be useful. But we don't have calculus available. (Cue rant from Larry Summers again...) We do have spreadsheets. And we can do an exhaustive search with a spreadsheet:

PS2, B2d Grid Search Calculations

Quantity	Demand Price (Willingness to Pay)	Supply Price (Opportunity Cost)	Average Opportunity Cost	Producer Surplus	Parameters	
0	\$10.00	\$0.00	\$0.00	\$0.00	Max WTP	\$10.00
1250	\$9.75	\$0.00	\$0.00	\$12187.50	Dmd. Slope	0.0002
2500	\$9.50	\$0.00	\$0.00	\$23750.00	Grid element	1250
3750	\$9.25	\$0.00	\$0.00	\$34687.50	Min OC	0
5000	\$9.00	\$0.00	\$0.00	\$45000.00	Sup. Slope	0
6250	\$8.75	\$0.00	\$0.00	\$54687.50		
7500	\$8.50	\$0.00	\$0.00	\$63750.00		
8750	\$8.25	\$0.00	\$0.00	\$72187.50		
10000	\$8.00	\$0.00	\$0.00	\$80000.00		
11250	\$7.75	\$0.00	\$0.00	\$87187.50		
12500	\$7.50	\$0.00	\$0.00	\$93750.00		
13750	\$7.25	\$0.00	\$0.00	\$99687.50		
15000	\$7.00	\$0.00	\$0.00	\$105000.00		
16250	\$6.75	\$0.00	\$0.00	\$109687.50		
17500	\$6.50	\$0.00	\$0.00	\$113750.00		
18750	\$6.25	\$0.00	\$0.00	\$117187.50		
20000	\$6.00	\$0.00	\$0.00	\$120000.00		
21250	\$5.75	\$0.00	\$0.00	\$122187.50		
22500	\$5.50	\$0.00	\$0.00	\$123750.00		
23750	\$5.25	\$0.00	\$0.00	\$124687.50		
25000	\$5.00	\$0.00	\$0.00	\$125000.00		
26250	\$4.75	\$0.00	\$0.00	\$124687.50		
27500	\$4.50	\$0.00	\$0.00	\$123750.00		
28750	\$4.25	\$0.00	\$0.00	\$122187.50		
30000	\$4.00	\$0.00	\$0.00	\$120000.00		
31250	\$3.75	\$0.00	\$0.00	\$117187.50		

When we do, we figure out that a price of \$5.00—halfway between the MOC P_{s0} of \$0 and the MWTP P_{d0} of \$10—generates the most surplus for producers: \$125000.

A note: whenever opportunity cost is flat, you will find that, for a simple linear demand curve, the producer-surplus maximizing price for producers to charge, if they can get their act together and successfully try to rig things for their benefit, is halfway between the maximum willingness to pay and that constant opportunity cost. That implies that producer surplus is maximized when producers are only making half as much as the commodity as in the

consumer-surplus and total-surplus maximizing free-market equilibrium. And that means that consumer surplus is, in the case of a flat opportunity cost, only 1/4 as much when producers are rigging the market to their benefit as in the free market.

e) What if PDC decides, instead, that it wants to set the price at a price that maximizes *consumer* surplus—to forbid anyone from charging more than the price it sets. What price would it choose? Why do you think it would choose that price?

Well, as long as the price set is greater than \$0/latte—and as long as producers cannot organize to strike—25000 lattes are sold, no? And, from consumers' point of view, a lower price at the same quantity has got to be better than a higher price, no? So PDC would set the price at, say, \$0.0001/latte. There would be substantial excess demand—50000 people would want to buy the 25000 lattes that are out there. But consumers would be very happy: they would be getting a very good deal indeed...

f) Suppose that a new political party emerges in Avicenna that claims that the free-market is anti-producer, and uses the extraordinary low and unfair price of lattes in the free-market equilibrium as its principal example. Do they have a case? If you think they do have a case, write one short paragraph explaining what you think their case is. If you think they do not have a case, write one short paragraph explaining to them why—in this case, at least—the free market equilibrium is not anti-producer.

I don't think they have much of a case in general. The free market amply rewards *rentiers*—people who do nothing constructive, but simply own resources that happen to be in scarce, fixed supply and for which there is high demand. In this case (and it is only in particular cases like this) the free market does as well in making producers better off as any other arrangement possibly could.