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Econ 200
Fall 2001 Schwab

Problem Set 3 Solutions to Problems 2 and 3

2. Do problem 6 on page 176. After economics class one day, your friend suggests that taxing food would be a good way to raise revenue because the demand for food is quite inelastic. In what sense is taxing food a "good" way to raise revenue? In what sense is it not a "good" way to raise revenue?

The first part of the problem is talking about efficiency. We know that this tax will not cause a lot of deadweight loss because the demand curve is quite inelastic. Due to the inelasticity of demand, our tax on demanders will not affect their behavior much; the quantity they choose before and after the tax implementation is about the same. Since deadweight loss is caused by distortion of behavior, and our tax will not cause much distortion, there will be little deadweight loss. This can be seen in figure 8-5 on page 167.

We know that taxes will cause a distortion of behavior and inflict deadweight losses on society. If we feel taxes are necessary, then one goal may be to choose taxes that make this deadweight loss as small as possible. In this efficiency sense, putting a tax on an inelastically demanded good is desirable since hardly any deadweight loss comes out of it.

The second part of the problem is talking about equity. If we think about the demand for food, we realize that everyone needs to eat pretty much the same amount of food. So no matter how rich or poor you are, everyone ends up paying about the same amount of taxes - they eat the same amount of food and pay taxes on the same amount of food purchases per person. The problem here is if we believe that regressive taxes are bad.

On page 256 in chapter 12, we find the definition of a regressive tax as being “a tax for which high-income taxpayers pay a smaller fraction of their income than do low income taxpayers.” Suppose every person needs to eat $100 worth of food each week, so that’s about $400 worth of food per month. Take a rich person earning $100,000 per month and a poor person earning $1,000 per month.

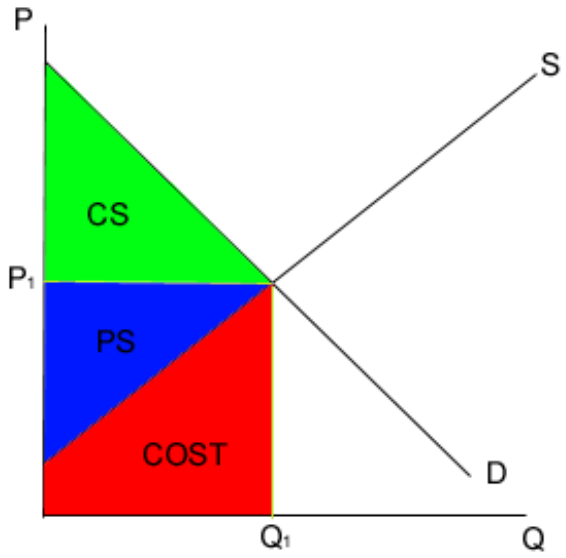
Now suppose our tax is a 10% tax on food. Everyone is buying $400 worth of food per month, so everyone is paying (0.10)*($400) = $40 in taxes per month for our new food tax. Since we have assumed that demand for food is quite inelastic, they will all still buy about $400 worth of food per month, even with the new tax. When we think about regressiveness of the tax, the 64 dollar question is: what fraction of their income is our rich and poor person paying?

Rich - $40 is 0.4 percent of $100,000
Poor - $40 is 40 percent of $1,000

Obviously, this tax is regressive because 40 > 0.04. Why would we think a regressive tax is bad? Mankiw has a discussion of vertical equity issues in chapter 12 that covers this kind of topic. Here's one way to look at this: It is probably a good idea to make sure that everyone has enough money to clothe, house, and feed themself and their family. If we tax a rich person, they are in no danger of starving or going homeless. But if we tax a poor person who barely makes enough to eat, then our tax might actually prevent this person from having heat or eating for a week. Some people agree with this line of thinking and some people do not.

3. Do problem 12 on page 12 on page 177 in Mankiw. This chapter analyzed the welfare effects of a tax on a good. Consider now the opposite policy. Suppose that the government subsidizes a good: for each unit of the good sold, the government pays $2 to the buyer. How does the subsidy affect consumer surplus, producer surplus, tax revenue, and total surplus? Does a subsidy lead to a deadweight loss? Explain.

First, we have a before case:

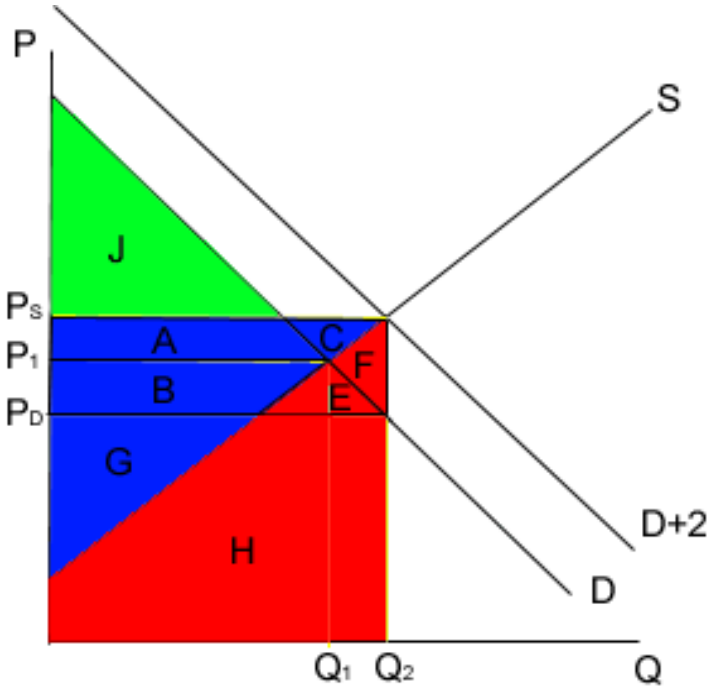


Here, the equilibrium is at (Q_1, P_1). The total willingness to pay of the demanders is broken up into three chunks:

$P_1 * Q_1$ = Total Expenditures by Demanders
That's the blue and red areas on this diagram. They would have been willing to pay as much as the blue and red areas PLUS the green area. Since they didn't have to in fact pay the green area, that's a bonus for them: consumer surplus.

Total Expenditures are also the Total Revenues made by Producers. They need to cover their costs which is anything under the supply curve - the red part. After paying for their production costs, they have all of the blue part leftover and that's a bonus for them: producer surplus.

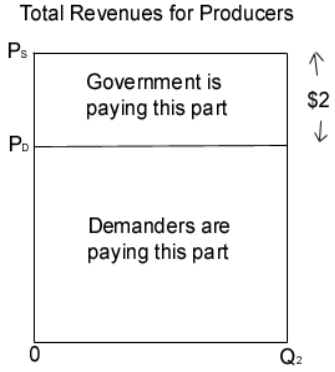
Now we are going to impose a $2 subsidy to demanders. Since the statutory incidence of this "negative tax" is on demanders, we know we will want to shift the demand curve.



Here we have shifted the demand curve up by exactly the amount of the subsidy to see how demanders act. The new equilibrium with the subsidy in place is at (P_S, Q_2).

The new CS is J+A+B+E, the new CS is A+B+C+G, and the total amount paid by government in subsidy is A+B+C+E+F.

Wait, why is CS = J+A+B+E? Remember that CS is anything under the demand curve that demanders *didn't actually pay for*. So the 64 dollar question is: what did these demanders/consumers actually pay?



We know that the Total Revenue received by producers is *not* equal to the Total Expenditures by consumers. Total Revenues = Total Expenditures + *the subsidy*! Consumers are only paying P_D * Q_2 but the Producers are receiving P_S * Q_2. Who is making up the difference?

That top portion (P_S - P_D) * Q_2 is exactly the subsidy amount being paid out by the government. In fact, we know that this subsidy is \$2 * Q_2. So how did total surplus change?

Before the subsidy, CS = J+A
Before the subsidy, PS = B+G
Total before subsidy: J+A+B+G

After the subsidy, CS = J+A+B+E = Anything under Demand that Consumers didn't pay for
After the subsidy, PS = A+B+C+G = All Revenue above supply curve
After enactment, Subsidy = A+B+C+E+F = The government's share of revenue paid
Total after subsidy:

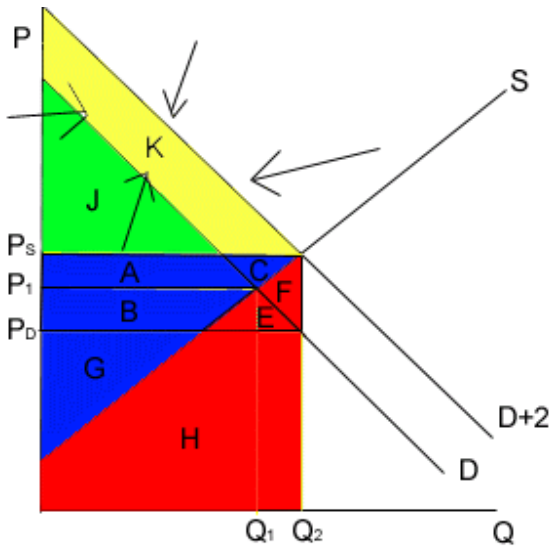
CS + PS - Subsidy = (J+A+B+E) + (A+B+C+G) - (A+B+C+E+F)
= (J+A+B) + (G) - F
= J+A+B+G-F

Now note that (J+A+B+G) = Before > After = (J+A+B+G) - F

Is there a deadweight loss? You bet. The deadweight loss is equal to the triangle F to the right of the old equilibrium point. Now the 64 dollar question is: why are we getting deadweight loss here?

The answer is that the subsidy is causing too many units to be traded. There are people getting units who do not value them as much as it costs society to produce them. This is like the health care problem that we had before. You can imagine some people who think "Well, I would like to have a dictionary, but I am not willing to pay the $7 price for one. I would only be willing to pay $6." Now suppose government steps in and puts a $2 subsidy on dictionaries. This person will now think "Oh wow! I only have to pay $5 for a dictionary because the government will pay for $2 of the price! I will go out and get myself a dictionary now because it is worth more to me than *I will have to pay*." This person is consuming a dictionary that perhaps cost $7 to make, but is only creating $6 of happiness.

When you look at the units between Q_1 and Q_2 on the diagram, these are exactly the kinds of people we are talking about. These are folks who don't value the good enough to justify allowing them to consume it (because it costs more to produce than they will like it). The subsidy reduces the cost of the good for these people by foisting it off on taxpayers (who did you think paid for the subsidy?), causing "negative surplus" units to be traded. For *every single one* of these units between Q_1 and Q_2, society as a whole is losing out for the benefit of these few individuals who get the subsidy.



One question brought up in Friday discussion: What happened to this yellow portion K? Why isn't this also considered consumer surplus? Didn't we move the demand curve?

I think this is why Mankiw doesn't want to show curve shifts in chapter 8 when he talks about tax effects on deadweight loss. His method of finding a gap between the supply and demand curves instead of actually showing the curve shift is so that he can cheat his way out of describing the distortive effect going on here.

Did we actually shift the demand curve? The answer is: sort of.

The D+2 line is not actually telling us how much people like this good. It is telling us how much people are willing to pay for this good *given that they know they will not actually pay that amount to eat the good*. The original demand curve tells us how much people are willing to pay if they are responsible for paying for the whole price. But when we slapped on the subsidy, consumers are no longer responsible for paying the whole price - and they know this.

Confused yet?

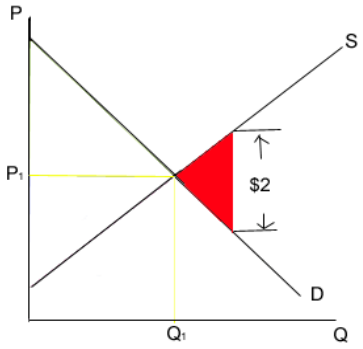
This is what we are referring to when we talk about distortion of behavior. The consumers get a certain amount of happiness when they eat this good. They are willing to pay the money equivalent of that "certain amount of happiness" in order to acquire it. When there are no barriers or taxes or anything in the way, the only people who are willing to buy a good are the people who get enough happiness out of it when they pay the price.

When you start screwing with the market by throwing in taxes or quotas or something, you're messing up the incentives in the market. If people don't have to pay the entire price of a good, are they going to want more or less of that thing? Of course they are going to want more of it. By changing the prices they have to pay for things, you've just changed all their opportunity costs - and since opportunity cost is what drives behavior, you've just changed what they are going to do.

But does that have anything to do with their actual tastes? No.

You can think of it like this. I personally like peanut butter a LOT. I love Reese's Pieces and Nutrageous and Peanut Butter Cookies. Naturally, I am willing to may more for a Peanut Butter Cookie than I am willing to pay for a Chocolate Chip Cookie. BUT, if you made Chocolate Chip Cookies REALLY cheap (by, oh... say... **placing a subsidy on them**), you might make them so ridiculously cheap compared to Peanut Butter Cookies that I will end up buying Chocolate Chip Cookies instead of Peanut Butter Cookies - *even if I don't really like Chocolate Chip Cookies that much.*

The true demand curve D was like the "true preferences" curve for the consumers in the market. The D+2 curve is kind of like a "screwed up preferences" curve. The consumers will make their decision using the "screwed up preferences," but their actual happiness from eating the goods will be determined by their "true preferences."



How would Mankiw's book method have shown the deadweight loss in this market? By finding a gap equal to $2 to the right of the equilibrium. Why to the right? Because the subsidy is allowing demanders to pay a price $2 less than what suppliers are receiving. And when we go to the higher prices on the right, the demand curve is below the supply curve due to the Law of Demand...