

Lecture 13 - Applying Consumer Theory to Competitive Markets

14.03, Spring 2003

1 Applying Consumer Theory to Competitive Markets

- When exchange takes place voluntarily, economists generally assume that it makes all participants better off. Otherwise, they would not have engaged in the exchange.
- It's useful to have a dollar metric of the gains from transacting.
- This measure is consumer surplus.
- This is critical because although we can readily measure the direct costs of a given project or policy (i.e., building a bridge, imposing a tariff), it's less obvious how we measure the benefits.
- Demand curves allow us to measure these benefits.
- Think of market demand curve as the set of consumers arrayed in inverse ordering from the person with the highest willingness to pay (WTP) for a good to the person with the lowest WTP.
- Similarly, think of the market supply curve as the set of producers arrayed in order from firm willing to produce at lowest price to firm demanding the highest price to produce a good.
- What market ideally does is match consumers and producers:
 - If a producer is willing to produce at a price less than or equal what a consumer is willing to pay, that transaction will occur.
 - Most consumers will be buying at a price *below* than their maximal willingness to pay.
 - Most producers will be selling at a price *above* their lowest willingness to produce.
 - Marginal producer and consumer will be indifferent.

- It is easy to see that when this mechanism works correctly, it maximizes the sum of producer and consumer surplus:
 - All gains from trade are realized.
 - All transactions that benefit both parties occur.
 - No transactions occur that do not benefit both parties.
- It is noteworthy that this metric does not place any greater weight on consumer or producer surplus:
 - If supply is perfectly elastic, all of the surplus is captured by consumers.
 - If demand is perfectly elastic, all of the surplus is captured by consumers.
- Why do we want to maximize surplus without any regard for who are the beneficiaries? Isn't there a tradeoff between equity and efficiency?
 - Answer: No, not in a competitive market. We'll study this issue shortly in general equilibrium theory.
 - But for the moment, take it on faith that we just want to maximize the pie, and we don't need to worry about who gets which slice.
- We often have pretty good data on producers' costs, which should reflect their willingness to pay.
- We often have less meaningful data on consumer's willingness to pay.
- But if we have an estimate of the elasticity of demand, this allows us to extrapolate a great deal of information about consumer surplus. That's because the elasticity is a measure of the slope (or curvature) of the demand curve.
- We're going to apply this reasoning to the system of U.S. Sugar Tariffs to perform a welfare analysis.
- This is a partial equilibrium analysis, using the tools of consumer theory that we have studied so far (plus a little producer theory from 14.01).
- We will leap into general equilibrium analysis next, but this is the last pure application of the partial equilibrium tools.
- As we proceed, three points to keep in mind:
 1. Distinguish carefully between *transfers* and *social gains and losses*.
 - If I pay a worker \$5 to do a job, that is *not* a \$5 social gain even though I have 'generated a job.'

- Why? This transaction is a \$5 *transfer* from me to the worker.
 - *If* there is a gain, it is because the value that the worker produces for \$5 is worth more than \$5 to me (i.e., consumer surplus) and/or the worker’s alternative use of time was less than \$5 (i.e., producer surplus).
2. A cost is not a benefit.
- This is a restatement of the above. If I double the generosity of welfare programs in the United States, what is the social cost of this? To a first approximation, zero. I am simply transferring money from one group of citizens to another. The social cost, if present, would only be due to the deadweight loss of taxation or the distortions that free money had on labor supply (and other behavior) of welfare recipients.
3. All costs are opportunity costs.
- In economic reasoning, there is no such thing as *intrinsic value*. The only cost of using a given resource is the value of its alternative to which it could have been put.
 - This is its *opportunity cost*.
 - Why is water so cheap, even though it is the source of all human life? Because there is an abundance of water (in Cambridge), so the opportunity cost of the last gallon of water out of your tap in the morning is quite low. But if there was a shortage, the price of water could rise to extremely high levels because the value of the first gallon of water is worth life itself.
 - Similarly, diamonds are expensive because at current quantities available, people seem to have only very high value uses for them (i.e., wedding rings). If diamonds were as abundant as dirt, they would presumably be as cheap as dirt too – and we would use them to make disposable champagne glasses for holiday parties. (Why diamond quantities are so limited, however, is probably due to cartelization of the world diamond market by De Beers rather than any natural scarcity.)

1.1 Sugar case

- Sources of sugar supply:
 1. World sugar supply:
 - Price: perfectly elastic at price \$0.068 per pound
 - Quantity: capped at 3.8 billions pounds
 2. U.S. sugar producers:
 - upward sloping from \$0.068 per pound at 1 pound to \$0.22 at 14 billion pounds.

– So $P_{domestic} = 0.068 + 1.09 \cdot Q$, where Q is billion pounds produced.

3. High fructose corn syrup (HFCS) producers:

– Supply: \$0.15 per pound for 12 billion pounds, infinite cost thereafter (until new plants built).

• Demand:

– We are given that: elasticity of demand is -0.30 and that domestic demand is 29 billion pounds at \$0.22 per pound.

– Use the functional form

$$Q(P) = KP^{-.30}$$

– Why this functional form?

$$\eta = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = -.30KP^{-1.30} \cdot \frac{P}{KP^{-.30}} = -.30,$$

so, this functional form has a constant elasticity.

– Applying in this example:

$$\begin{aligned} 29 &= K(22)^{-0.30} \\ K &= 29(22)^{0.30} = 73.3 \\ Q &= 73.3(22)^{-0.30} \end{aligned}$$

• Loss of consumer surplus?

– Can integrate $\int_{6.8}^{22} 73.3P^{-0.3} \partial P = 5.1$ billion.

• Gains in producer surplus?

– *Why won't gains to producers be identical to corresponding losses for consumers?*

– Foreign producers (Do you want to count these gains? What are the politics that makes this large transfer feasible?)

$$3.8(22 - 6.8)/100 = 0.58 \text{ billion}$$

– U.S. sugar producers

$$\begin{aligned} \text{Excess Costs } 13.2(22 - 6.8)/100 &= 2.01 \text{ billion} \\ \text{Production costs} &= 1.00 \text{ billion} \\ \text{Producer surplus} &= 1.00 \text{ billion} \end{aligned}$$

– HFCS producers

$$\begin{aligned} \text{Excess costs } 12(22 - 6.8)/100 &= 1.82 \text{ billion} \\ \text{Production costs } 12(15 - 6.8)/100 &= 0.98 \text{ billion} \\ \text{Producer surplus} &= 0.84 \text{ billion} \end{aligned}$$

- What is the consumer cost of this policy? \$5.1 billion per year of lost consumer surplus.
- How does this compare to the gains to U.S. sugar producers? \$1.00 billion to domestic sugar producers, \$0.84 billion to HFCS producers, \$0.58 billion to foreign producers.
- Total gain of \$1.9 billion for domestic producers plus \$0.6 billion to overseas producers.
- Q: Would overseas producers be better off without this policy?

1.2 Accounting

Accounting for costs and benefits

	Quantity	Production Costs	Revenue	Producer Surplus	Consumer Surplus	DWL
Foreign	3.8 bil	$3.8(.068) = 0.260$ bil	0.84 bil	0.58 bil	-0.58 bil	0.0 bil
HFCS	12 bil	$15(.12) = 1.8$ bil	2.64 bil	0.84 bil	-1.82 bil	-0.98 bil
Domestic	13.2 bil	$\frac{1}{2}(13.2)(.288) = 1.90$	2.9 bil	1.00 bil	-2.00 bil	-1.00 bil
Reduced Consump	12.2 bil	0	0	0	-0.72 bil	-0.72 bil
Total				2.42 bil	-5.12 bil	-2.7 bil

1.3 What about Michael Warner of the American Sugar-beet Growers Association?

- He points out the \$300 per pound loss in domestic sugar production in North Dakota over $\frac{1}{4}$ million acres? Is this loss $\$300 \cdot 250,000$?
- What about the 30,000 sugar beet farming jobs in North Dakota that Warner stresses? What are the economic losses if these workers are not needed for sugar production? Are they $30,000 \cdot \text{AnnualEarnings}$?
- Is it significant that Mr. Warner counts *both* the lost in crop production of $\$300/\text{acre}$ and the loss of jobs of 30,000 workers as costs of eliminating the program?

– This is clearly double-counting.

- The workers should be viewed as costs to sugar producers and their wages should be subtracted from the crop production per acre – along with all other variable costs and the opportunity cost of the land – to get a measure of the potential surplus generated by using this land for sugar production.
- Stated differently, farmers would be delighted to fire all of their workers if they could still get \$300 per acre in direct subsidies. So clearly you can't count both the sugar income and the expense of employing the workers both as social benefits.

1.4 Consider

- There were at the time of the case 8,360 sugar farms in the U.S. So this is implicitly a subsidy of

$$5.1/8,360 = \$0.610 \text{ million per farm.}$$

- Also consider that 1,400 farms account for about 50% of all production.

$$5.1 \cdot 0.5/1400 = \$1.82 \text{ million subsidy per farm for these farms.}$$

- What would be the reaction of farmers if we proposed to open the U.S. to world sugar prices and gave a cash payment of \$0.610 million per (former) sugar farm per year?
- How would the High Fructose Corn Syrup producers (Archer Daniels Midland) feel about this?