Lecture 12 Smart Markets

In this lecture, we want to critique the basic model of an exchange market. We will see that markets fail. We will then show how we can construct smarter markets to enable us to overcome the inefficiencies in a standard market. We will then take up the Coase Theorem.

In our previous lecture, we saw how markets led to efficient outcomes (with the caveat that sometimes the distribution created may not make us especially happy). We then revisited an example with the U.S. and Iraq, in which markets do not lead to efficient allocations of goods, because the U.S. cares how many weapons Iraq has. This is just one example of an *externality*. (Notice how the language is loaded - it is not called a *unavoidable* or a *fundamental*!)

1 Externalities

We are going to consider several types of externalities: positive, negative, network, and spatial.

1.1 Positive Externalities

Sometimes the value of two goods together exceeds the value of the goods separately. If this is the case, it is not clear how to price each of the goods. Suppose that shoes are sold separately. A left shoe is worth very little, as is a right shoe. Together, they are worth a whole bunch. This can make pricing difficult. The way that we get around the problem is by bundling, by selling the shoes together.

1.2 Negative Externalities

A negative externality occurs when the consumption or use of a good has a negative effect on others. Pollution is a negative externality. Currently there is debate about snowmobiles in Yellowstone Park. The argument against the snowmobiles is that they pollute. In response, the industry now makes four cycle snowmobile engines which pollute about as much as cars. Previously, snowmobiles had two stroke engines like lawn mowers, so they generated lots of particulates. The use of a snowmobile creates a negative externality. If that externality is not priced, then there will be too much snowmobiling.

1.3 Network Externalities

A phone is worth very little unless other people have phones. The same is true of languages. Other people must speak it for the language to be of much use. When the value of a commodity depends upon the number of people in your network who also have the commodity, then the commodity has network externalities. Network externalities are interesting because their presence implies that some really good ideas may never get started and that we can sometime lock into the wrong idea or technology.

2 Spatial Externalities

This next example is a simplification of the FCC spectrum auction. In the first two auctions the FCC raised over 20 billion dollars. Some of the licenses sold for hundreds of millions of dollars.
An Example We're going to sell the rights to own a new band for radio frequency that can travel 400 miles. There are three cities currently up for bidding: San Diego, Los Angeles, and San Francisco. There are four potential bidder for these rights with values as given in the table below:

Bidder	SD	LA	SF	SD-LA	LA-SF
hline 1	5	5	0	50	4
2	25	10	0	50	10
3	0	15	20	15	40
4	0	10	10	10	55

Imagine that we have the following market prices: SD = 5, LA = 45, SF = 20. Bidder 2 gets LA and SD and bidder 3 gets SF. The total amount raised equals 70. Now suppose instead that we sold SF and LA to bidder 4 and SD to bidder 2, we could raise 80. There is a market failure because we're not pricing the externalities. There is a benefit to owning both SD and LA or both LA and SF beyond just owning one.

2.1 Smart Market 1: Withdrawal

Solution: *Allow people to withdraw bids.*

Logic: *This is a packing problem, so let people throw out more information.*

Bidder 4 could make a bid of 25 for SF and 29 for LA. Bidder 2 could then withdraw her LA bid and make a bid of 20 for SD. Both now are better off than they were and we have the efficient outcome. A potential problem is that all sort of bids could get withdrawn simultaneously and the whole market could become a mess.

2.1.1 Smart Market 2: Bundles

Solution: *Let people bid on bundles.*

Logic: *pairs of shoes*

Bidder 4 could make a bid of 54 for SF and LA. Bidder 2 could bid 24 for just SD and 49 for SD and LA. The efficient allocation would be found. The potential problem with this solution is that finding who is winning at any moment in time could be computationally difficult. A problem with this procedure as well is that a firm could be losing several licenses. Someone else could make a bid and the result could be that they are suddenly winning more licenses than they can afford.

In the FCC spectrum auctions, they decided to let participants withdraw their bids. The problem with bundles is that once there are forty locations, there are 2^40 (a trillion) bundles.

2.1.2 Pricing Externalities: The Coase Theorem

The prevailing wisdom about how to deal with external effects is to price them. To price the external effect requires that we assign property rights to it. There is a seminal paper written by Ronald Coase (He won the Nobel Prize in Economics for this idea and others) that advocates assigning these rights. The Coase Theorem says that (under certain conditions) regardless of who gets allocated a commodity initially, the final allocation will be the same. Coase also said that one of those conditions - no transactions costs, wasn't likely to hold. Here is the idea. Suppose that it is worth \$100 to me to play by boom box. Suppose that you would pay \$150 to have me not disrupt your quiet afternoon. Consider each of the following two possibilities:

I get property rights: If I get the property rights to make noise, then you will pay me \$100 to not play my boom box.

You get property rights: If you get the property rights to make noise, then I will not make noise.

What Coase argued is that the final allocation does not depend upon who gets the property rights. That is true in this example. And because of this example the Coase Theorem has become the basis for a tremendous amount of law. But this is an example, not a model. The problem is not with the Coase Theorem per se, but with its application. As mentioned, it is only true under some fairly restrictive conditions, a fact that its proponents often ignore.

First, I want to convince you that the Coase theorem often will not hold. Suppose that we are considering the allocation of the radio spectrum. The Coase theorem says that it does not matter if we give those property rights to large media firms or if we give them to one of you. The reasoning is that you would just sell slots to the media firms. What this reasoning leaves out is that part way through selling slots on the radio dial, you would be really really rich. If you were really really rich, you might start to care less about money and more about having several good country stations on the radio. As a result, you may sell 40% of the slots to country and western stations.

Therefore, when we assign property rights, if there are wealth effects, then who gets the rights matters in the final allocation. What we want to see now is how that works.

2.2 Some Math

Let's first consider the case with no wealth effects. This means that money remains equally valuable as we amass more of it. Let's assume that the other good is clean air. We'll consider a world with two people: Bob and Loras. In this first version, we can write down their utility functions as follows: Let m denote the amount of money that a person has and c be the amount of clean air. Let's suppose that there are twenty units of clean air to be sold. We assume that Bob likes clean air and that Loras likes to snowmobile. So Loras's utility is decreasing in clean air.

Bob's Utility $U_B(m, c) = m + 3c$

Loras's Utility $U_L(m, c) = m - 3.1c$

Let's assume that each has \$100 on hand. Again, we have two scenarios to consider.

Bob gets property rights: Since Loras wants to pollute more than Bob wants clean air, Loras can pay Bob \$3 a unit for the clean air. Bob and Loras are both happier and all twenty units are sold.

Loras gets property rights: Bob may try to buy the rights to the clean air, but Loras asks for too much money.

This is just a more mathematical version of the simple case we already considered. However, now we want to change the model. We will assume that Bob's marginal utility from money decreases as he gets more.

Bob's Utility $U_B(m, c) = 20\sqrt{m} + 3c$

Loras's Utility $U_L(m, c) = m - 3.1c$

As before assume that each has \$100 on hand. Again, we have two scenarios to consider. We have to do a little bit of math here. The marginal utility of a dollar to Bob equals the derivative of his utility function. This is $\frac{20}{2\sqrt{m}}$, which is one unit. Let's first consider the case where we assign the property rights to Loras.

Loras gets property rights: Bob may try to buy the rights to the clean air, but Loras asks for too much money. Bob's marginal utility from money would increase if he were to buy any clean air, so he will definitely not buy any. The result is the same as in the first case.

Bob gets property rights: First, we have to determine how much Loras would have to pay Bob to buy all 20 units. Previously, Bob's utility was 20*10 + 60, which is 260. If he pays him x Bob's utility will be $20\sqrt{100 + x}$. If we set this equal to 250, we get that $(100 + x) = 13^2 = 169$. So, Loras would have to pay Bob \$69 for the twenty units. This is \$3.45 a unit which is more than Loras is willing to pay. Therefore, Loras will not buy all twenty units.

We can solve for how many he can buy at\$3.10 a unit. It has to be such that Bob is equally happy selling or not. His previous utility was 260. If he sells N units at \$3.10 a piece, his utility is $20 * \sqrt{100 + 3.1N} + 3 * (20 - N)$. If we set this equal to 260, we get the following equation

$$20 * \sqrt{100 + 3.1N} = 200 + 3N$$

If we then square both sides we get

$$1240N = 1200N + 9N^2$$

which reduces to

$$0 = 9N^2 - 40N$$

so $N = 4.4444$. Not the difference. If Bob gets the property rights, he sells about four units to Loras. If Loras gets the property rights he doesn't sell any to Bob. This difference is caused by the wealth effect.