**W12 V1 The Problem with Externalities**

0:09  
In this video, we're going to start by defining externalities, classifying them, talking about the difference between the market outcome, efficient outcome, and conditions under which a deadweight loss will be the result of an externality.

0:24  
So what is an externality so far in a transaction or in when somebody's undertaking an action, they are the only ones bearing the costs and benefits of that action or in consumers and producers for that transaction.

0:39  
If somebody external to that is being affected by that transaction, we say that this is an externalities.

0:45  
For example, when people drive on the highway and there's lead emissions, babies who live around that highway are being affected negatively through that transaction or your action of driving along the highway.

0:58  
We would say that impact on the baby is an externality, OK.

1:04  
A government would not count in here because sometimes students will say, look, money is flowing from the consumers pocket is going to the producers pocket.

1:12  
The government is getting some money from that.

1:14  
It is not an externality because the government is participating in that transaction, right.

1:19  
Money is flowing from the consumer to the producer.

1:21  
The government jumps in and pulls some money out of that transaction.

1:24  
It's kind of a participant in that flow of money in that transaction.

1:27  
OK.

1:28  
This is somebody who's completely external to that being affected.

1:31  
They could be affected positively or negatively.

1:34  
That's how we classify this as a positive externality or a negative externality.

1:40  
OK, sometimes we have to figure out whether this is a consumption or a production externality.

1:45  
And one primary reason for this is we need to know whether to put this on the demand side or on the supply side of marginal social benefit or cost.

1:55  
OK, so here it's going to be a very simple classification.

1:59  
Does your act of consuming a good Causeway the cost of the benefit to the external person, if you're act of consuming it, causes the externality.

2:08  
We'd call that a consumption externality.

2:09  
We'd put that on the demand side.

2:11  
If you're act of producing the good causes the externality, then we'll put that on the supply side and then we would call that a production externality.

2:20  
Positive or negative doesn't matter.

2:22  
The act of what causes the externality, that's what matters for consumption of production.

2:28  
OK, now an externality introduces a wedge between private and social costs or benefits.

2:36  
So let's start off by talking about costs.

2:38  
OK, costs.

2:39  
As we know, we're going to always put it on the supply side.

2:42  
Why?

2:43  
Because when people are producing stuff, that's their private cost of production, that's what leads us to the supply curve and the shape of the supply curve.

2:50  
And that's all we've been focusing on now, OK.

2:53  
But now if the social cost is not the same as the private cost, it has to be because the act of production causes the externality, right?

3:03  
So when I produce it, it's not just my private cost, it's also the external cost being imposed on that.

3:12  
So the cost to society will be higher than my private cost because I'm adding on the cost of the externality.

3:20  
Everything that we've done for the supply curve has always been marginal cost, the extra unit, the extra unit, we're going to keep that thinking in here.

3:28  
So even if you're given data on total externality cost, you must convert this into marginal external cost, OK, Because we want to keep that inside of our thinking at the margin, thinking at the margin for society.

3:40  
Extra units, should it be produced depends on the extra social cost.

3:44  
OK, please watch out for that.

3:45  
That's a classic trick in here.

3:48  
OK, now if the cost imposed is a negative externality, right for production, then it's going to raise the social cost.

3:57  
On the other hand, if the act of production decreases the cost of society, so the act of producing more apples means I've got to plant more trees.

4:06  
More trees is good because of, let's say, better, cleaner air.

4:11  
Then the act of production causes a benefit to society and it would actually mean that the cost to Society of me producing more apples is lower than the private cost of producing the extra apple because of this extra benefit in there.

4:26  
OK, so two classifications.

4:29  
One is should I put it on the production side or the OR the consumption side?

4:33  
If the act of production is what's causing it, stick to the supply side because that's where you're looking at.

4:38  
OK.

4:38  
Now the impact on supply can be positive or negative depending on whether it's a positive externality or a negative externality.

4:46  
And there that just helps you figure out whether the social cost is higher than the private cost or lower than the private cost.

4:52  
It may be easier to see this on a diagram.

4:55  
OK, so pick a quantity.

4:56  
Doesn't matter what quantity you pick.

4:59  
This here is my private cost of producing the extra unit.

5:05  
So this is the marginal private cost of doing that.

5:08  
If my act of production of gasoline imposes an external cost to society, I'm going to have to figure out what that cost is, right?

5:18  
That's the extra this here would be the marginal external cost of producing that extra unit.

5:28  
I'm going to add that on.

5:30  
We're bringing in stuff from the earlier modules.

5:32  
What happens in the cost increases that's going to raise the social cost relative to the private cost.

5:37  
And then now this is going to be here, my marginal social cost, OK, which is the sum of the private cost plus the external cost.

5:48  
This is when your flexibility of thinking about the supply curve moving up or down or in or out helps you, OK?

5:55  
If it's a benefit, the act of producing more apples reduces the cost of society because there's a marginal external benefit, then in that case my marginal social cost will lie below my private cost, right?

6:14  
Reduction at every quantity.

6:16  
How much it shifts just depends on what the marginal external cost is at that quantity.

6:20  
You guys have done this with supply.

6:22  
It's just flexibly using that concept in here to apply it to social costs and benefits.

6:27  
Exactly the same reasoning for the demand side.

6:31  
If the act of consuming the unit causes the externality, we're looking on the demand side.

6:36  
We're always converting it to marginals.

6:38  
That's how we work based on module one starting there, right?

6:42  
If it is a benefit, an additional benefit, it's gonna raise the social benefit.

6:48  
It's gonna move it up.

6:50  
If the act of consumption reduces the benefit to society, right.

6:55  
So everyone's consuming a lot of gasoline, right?

7:01  
That extra gasoline, Sure, people are happy about that.

7:04  
But the act of driving the cars consuming the gas imposes a cost on society.

7:09  
Then the benefit to society from driving that extra mile is lower than before.

7:14  
OK, same thing on a graph.

7:16  
OK, pick a quantity.

7:17  
I don't care what quantity is.

7:18  
Make sure it's the act of consuming that's causing it.

7:21  
This is my marginal private cost benefit.

7:25  
Sorry.

7:25  
In this case, I'm going to add on the marginal external benefit if my act of doing something imposes a benefit to society.

7:40  
So if I get a university education, I benefit from that.

7:43  
That's my private benefit.

7:45  
That's why I want to buy a university education.

7:47  
But I also impose a positive externality on society as a whole, so that externality cost is added on and we get a higher social benefit.

7:56  
If, on the other hand, my act of consuming gasoline imposes A marginal external cost, then the benefit to society will be lower than the private benefit, and that's going to move it down in here.

8:12  
How much it moves down depends on the marginal external cost of benefit at that extra unit.

8:18  
Now why do we need this?

8:20  
We need this because we want to compare market outcomes to efficient outcomes.

8:23  
Market outcome depends on private costs and benefits.

8:26  
And as we've seen, that depends on willingness to pay marginal cost, and we know how to do that.

8:31  
So far we've been saying markets are exactly efficient because when we look at efficiency, we are saying this is efficient social, social, not private right.

8:43  
Social benefits, social costs and without externalities.

8:47  
These two were exactly the same.

8:50  
Private costs and benefits were exactly equal to social costs and benefits because nobody else outside was being affected.

8:55  
When we have externalities, this is not the case.

8:57  
There's a gap between social costs and benefits and or private costs and benefits, right.

9:03  
In that case, market quantity is not going to be efficient quantity.

9:07  
And we have to figure out what this means in terms of a loss to surplus to society.

9:13  
The best way to do this is graphically.

9:15  
So let's think about a marginal external cost imposed on society by production, the act of production, OK.

9:24  
That's why the cost of society is going to be higher than the private cost and the act of production causes the externality.

9:31  
So I'm moving the supply curve, OK in here.

9:34  
First thing to figure out is what is the efficient outcome.

9:38  
OK, so we're going to say the efficient outcome is this one where marginal social cost equals marginal social benefit.

9:48  
So if you ask me what is the efficient surplus it is going to be for all of these units in here when the marginal social cost is at least as high as the marginal social benefit, because in this case that is what it is.

10:03  
Keep that in here.

10:03  
This is going to be the efficient surplus.

10:05  
So efficient outcome is Q efficient and the efficient surplus, the maximum surplus will be this red area.

10:15  
OK, I'm going to erase it for now because I'm going to put some other stuff in there, but I'll put it back on next step.

10:20  
What's the market outcome, market outcome?

10:23  
I throw away any social costs and benefits.

10:25  
I focus only on private costs and benefits.

10:28  
That's what we've been doing so far.

10:30  
This is my market quantity, market price, sure, I'm going to need that if I want to divide surpluses, but if I'm just looking at total surpluses, that's market surplus.

10:41  
OK.

10:41  
So let's do market quantity Q market.

10:48  
Now let's break up market surpluses into all of the various surpluses that we have.

10:54  
OK, so first thing I need is consumer surplus.

10:57  
Consumer surplus I need quantity, I need price.

11:00  
This is price.

11:03  
So market quantity is QM, Market price is PM.

11:10  
OK, so consumer surplus will be this area here different between willingness to pay and the market price.

11:20  
So consumer surplus will be this region here, producer surplus again, marginal cost, marginal private cost.

11:31  
The difference between the price I actually get and my marginal cost, take that difference.

11:37  
This here is going to be produce a surplus.

11:42  
Nothing different from what you've seen before.

11:46  
No, the other way around.

11:54  
OK, Any governments in here?

11:55  
Not yet.

11:56  
So there's no government surplus.

11:58  
Anybody else being affected?

11:59  
Yes, there is somebody being affected and that person is the external cost and benefits.

12:03  
OK.

12:04  
So I need to check the external cost in this case because it's a cost being imposed on society.

12:09  
It's a cost.

12:10  
So it's going to take away surplus is going to be negative surplus.

12:13  
How much of that is, what is the cost, the total cost?

12:17  
Well, each one of these units here, I'm being affected by that much, right.

12:21  
Each one of these units, that's the external cost and benefits.

12:24  
That's how I derive the social cost curve.

12:26  
So what I'm going to do here is to say the I'm just going to erase the green area so you can see it and I'll put the green area back.

12:33  
OK.

12:33  
What we're going to see here is that for each one of these little units in here, this is the external cost.

12:42  
But I'm going to increase it all the way until we're talking about all the quantity produced because the externality is being imposed for every unit that's actually being produced and got to go all the way up to the market quantity.

12:56  
So the marginal external cost imposed in society, it's a negative surplus, it's taking away surplus, will be this region all the way up to the market quantity.

13:07  
OK.

13:07  
So what is total surplus then?

13:10  
I'll just put the green this way so that we can differentiate it from the black.

13:15  
OK.

13:15  
What is total surplus?

13:16  
Total surplus here is the sum of all of these individual surpluses, so total surplus at the market.

13:25  
So market surplus will be consumer surplus, producer surplus, minus the external cost because that's dragging down surplus in here.

13:38  
If I look at it visually, what is the market surplus going to be visually?

13:44  
I have that blue of consumer surplus, I have the green of producer surplus, but there's something in here that's coming and taking away something in there.

13:52  
So what am I left with?

13:53  
What I'm left with is this region.

13:59  
OK, up to the efficient quantity, I'm left with that region because that black area is taking away some portion of producer surplus.

14:06  
Some portion of consumer surplus is negative in here.

14:09  
But I don't stop that.

14:10  
I keep going, right?

14:12  
I keep going and notice I've got that extra portion in there, right?

14:18  
So market surplus is all of this shaded area with the caveat that I'm taking away this particular region in here.

14:31  
So it's going to be less than that shaded area.

14:33  
I want to show that slightly different.

14:36  
So I'm going to put that in a different shade.

14:50  
Mark Its surplus will be the green area minus that blue area in there.

15:00  
If I want to compare that to the efficient surplus, what is the efficient surplus?

15:03  
I put it as the red area which I erased, but it is also the same as this current yellow area, right?

15:12  
So in that sense, if I'm looking at the efficient surplus and I'm looking at the market surplus, what's the gap?

15:18  
The gap is this.

15:20  
This here is deadweight loss, right?

15:25  
That's the surplus I'm losing because I'm over producing relative to efficient.

15:30  
There's a negative impact on society relative to the benefit to society because of the higher cost in there, right?

15:38  
That's the deadweight loss due to externalities.

15:40  
You're over producing market over produces because producers are not taking into account the impact of their actions on society and they shouldn't because that's what the definition of an externality is.

15:49  
I only base my decisions based on my private costs and benefits.

15:53  
You can do the same thing for a positive externality.

15:56  
OK, efficient quantity is here.

16:07  
OK, efficient surplus is here, which I'll put back in like last time.

16:11  
This is efficient surplus.

16:13  
OK, market.

16:21  
Let's look at the market.

16:22  
Market quantity, private costs and benefits.

16:27  
Market price based on that, OK, now I can start talking about consumer surplus, producer surplus in here.

16:42  
Consumer surplus, marginal willingness to pay versus price.

16:46  
Let's make it a little bit neater.

16:49  
Consumer surplus, we're just using the definitions.

16:54  
Consumers don't care about the external impact, they just care about their willingness to pay their price.

16:58  
Producers, same, their willingness to pay their price, Add all of that in here, but here's somebody external is being affected.

17:09  
So what's the external?

17:10  
But here it's an external benefit, OK.

17:13  
So this is going to be a plus to surplus, adding surplus.

17:17  
How much surplus am I adding?

17:19  
I'm adding this amount for every unit that is being produced at the market.

17:25  
So I stop at the market quantity.

17:32  
Total surplus will be the sum of all of these.

17:43  
Compare that to efficient.

17:49  
That is efficient surplus.

17:51  
What's the problem?

17:52  
We are losing that.

17:55  
That is surplus that somebody should be getting and nobody is getting because those trades are not happening.

18:05  
Those trades have a positive impact to society.

18:08  
But because people are not taking that into account, because it's an externality, by definition they don't take that into account.

18:13  
We are losing trades that would be a net gain to society.

18:16  
That don't happen.

18:17  
OK, please don't memorize them as being triangles, because sometimes they may not be triangles and the triangle may not be where you expect.

18:23  
Just focus on the concept and you can't go wrong in here, OK.

18:28  
So we have figured out how to classify externalities, positive, negative, whether they should go on the demand side or positive or the supply side.

18:35  
We've identified how to use that information to figure out whether the curve shifts up down depending on demand or supply.

18:42  
And then using the market outcome in terms of quantity and price and the efficient outcome in terms of just quantity, because there is no efficient price, because the efficient doesn't actually happen.

18:53  
There's no efficient price, just an efficient quantity and an efficient surplus.

18:58  
Comparing the two, we're going to get either overproduction or under production relative to efficient.

19:04  
And that overproduction results in a net loss to society.

19:07  
The deadweight loss under production results in too few units being produced and a loss to society because profitable trades are not happening from a society perspective.