**W12 V3 Social Norms and Pollution Pricing**

0:09  
In this video, we're going to talk about additional interventions that can help correct the problem due to externalities.

0:15  
With everything we do, we're always going to focus on why that particular intervention is able to achieve its goals.

0:22  
There are many interventions we're going to consider.

0:24  
We've already talked about taxes and subsidies, and if we choose the correct Pigouvian tax or subsidies, what it does is it allows people to take the externalities into account when making their choices because they're effective price changes.

0:40  
With everything we do, we're going to follow the same kind of thinking process.

0:44  
Right now, we're going to talk about social norms.

0:46  
So this is not an explicit intervention that the government does.

0:50  
This is something that society could do in order to address externalities.

0:56  
Now, when we think about social norms or regulations, these are not necessarily explicit rules put down by the government and enforced by the government.

1:04  
But they are social rules that address our private costs and benefits by introducing a certain aspect that has to do with how we feel about how people perceive our actions.

1:20  
So, for example, if I throw garbage on the street, I'm thinking about my own private costs and benefits.

1:26  
But the fact that everyone is going to look at me and I feel like they're judging me for throwing garbage on the street, if that affects me, then that's a cost that I will take into account when I'm making my decision to throw garbage on the street, right?

1:38  
So this is an example of what we call social sanctions, social disapproval, or just more broadly, the way people think about us and how we feel about that.

1:49  
And do we take that into account when making our decisions?

1:52  
OK, so for example, if throwing garbage on the street imposes an externality, then the threat of social disapproval, if I take that into account, it changes my private cost of throwing garbage on the street and therefore changing my choice and my actions.

2:08  
And that could be one way of changing people's actions through changing their incentives.

2:14  
If they're doing something, that's a good thing, right?

2:17  
So switching from using plastic bags at checkout to carrying your own cloth bags, if you look at that as a social recognition, you and that people look at me and they think positive things about me, that makes me happy.

2:31  
That increases my private benefit from that action.

2:34  
And I'm more likely to use reusable cloth bags instead of plastic bags.

2:39  
So these are ways through social and we are social animals, right.

2:42  
So even though there's not an explicit, you know, here's the fine, here's the subsidy, there are ways to kind of get us to change our actions, but again, they have to change our private costs and benefits.

2:55  
Otherwise, we are not changing anything.

2:57  
We do.

2:59  
OK, now, sometimes these rules are explicit.

3:02  
Sometimes there's an explicit rule that everyone in society follows.

3:06  
You may have noticed this if you ever go to a different country and they have different rules, and you notice that there are certain patterns that people follow and they seem to know, and they seem to follow these rules that kind of regulate behavior.

3:21  
That's another way of kind of having an expression of what we call social norms, right?

3:26  
And so if you behave outside of the norm, then that makes you feel bad.

3:30  
And that's kind of another way of getting people to internalize externalities.

3:34  
These are very vague.

3:35  
These are very hard to make happen because they involve changing equilibrium and so change can happen.

3:43  
But it's very rare for us to rely on these kind of mechanisms to work, which is why we typically advocate for more active interventions for the government.

3:51  
That said, as you see what's happening with climate change, when people and enough of people, the critical mass of people, start to think about important things, you could get social norms changing to affect externalities.

4:04  
OK, another thing that you may have heard of, especially when we're thinking about pollution and climate change, is this thing about explicitly addressing the problem causing things.

4:15  
So for example, if pollution is causing the problem, then maybe we can have a price of pollution.

4:20  
Or you may have heard the terminology cap and trade.

4:23  
So let's examine that a little bit more in the next part.

4:28  
So when we have climate change, we typically have a cause for it.

4:32  
And for example, suppose it's carbon emissions or pollution causing climate change.

4:36  
We can have taxes and subsidies, but the problem with taxes and subsidies is that it is typically put in the output market, right?

4:44  
There is many things that cause pollution.

4:48  
Many markets, the act of production, the act of consumption cause pollution.

4:52  
And if we're going to go to individual markets, then we're going to go to the auto industry, we're going to go to the chemical industry, and each one of them are going to intervene in.

4:59  
Now, there is potential for causing lots of dead weight loss because we're not only addressing pollution, we're also causing distortions in the auto market, distortions in the chemical market, right.

5:08  
So sometimes when you can identify something that's a problem and that cuts across many different industries, maybe we want to directly focus on the problem causing thing, right.

5:19  
So for example, if we say carbon emissions or pollution more generally, is the problem causing thing, then maybe let's directly regulate that.

5:28  
Now, what does that mean when we don't really have a market for pollution, right?

5:32  
How do we kind of think about that?

5:34  
So one of the problems with externalities is what we call is a missing market.

5:38  
Kind of try and make that a little bit clearer as we talk about this.

5:42  
OK.

5:43  
I'm going to do this in two different ways.

5:46  
One, because they help me talk about two different things that you see in reality, like cap and trade and pollution pricing.

5:53  
And two, because they show you that there's effectively 2 problems in here with market interventions.

6:00  
We've seen this in earlier aspects.

6:02  
We've seen this in the market interventions module.

6:05  
When we said, you know what, there's a quantity we're overproducing, we're underproducing, and that's what's causing deadweight losses.

6:11  
But there's also this problem of misallocation.

6:14  
So giving you two ways to view a similar intervention helps highlight those two aspects separately.

6:21  
So in version one, I'm going to talk about it as a cap and trade.

6:26  
So you can only pollute if you have a pollution permit.

6:31  
There's a fixed amount of pollution and you can't trade more than that, right?

6:35  
With that, I really wanna focus on this idea of and there's a quota.

6:41  
I'm going to relate this back to the quota module and kind of bring that aspect in there.

6:44  
And I'm going to use the same thought exercise as we used in the quota modulus idea of a golden ticket, right?

6:49  
There's a pollution permit and who gets this golden ticket?

6:52  
I'm also going to highlight some notions of allocation issues.

6:55  
I'm not going to delve too much into that.

6:58  
I'm really going to focus on the cap and the trading aspect of it and then we'll explore the the allocation aspect a little bit more in version 2 when we have a price of pollution, but really we're thinking about who should be producing pollution, we're going to frame it as who should be reducing pollution, OK.

7:20  
So two ways they're going to have the same effective outcome.

7:24  
We're just going to allow us to highlight different aspects of the market and of this interventions.

7:31  
OK, So what does it mean to say don't pollute?

7:34  
We're gonna say you are going to reduce pollution and something in Canada and the amount of pollution is going to go down, somebody has to reduce it.

7:43  
Well, if we are gonna think about firms here because again we can think about this as consumption side, firm side, it can be complicated.

7:51  
So let's make it really simple and just focus on firms.

7:54  
And let's think about the only way to kind of reduce pollution is for firms to either invest in greener technology, right?

8:01  
Something that reduces pollution, change its production processes, or something that actively allows them to reduce pollution.

8:08  
So they really need to think about their incentives.

8:11  
So we'll start from a market perspective, number one.

8:14  
And then in version two, we'll focus on the firm's perspective, explicitly thinking about the costs and benefits of reducing pollution.

8:22  
OK, I'm going to be using the word abatement a lot in version two.

8:25  
It's just a fancy word of saying reduce pollution.

8:29  
We use that terminology because if you are interested in climate change and you are looking around to read more about it, you may come up, you may see this word outside.

8:37  
And so we just want to make sure you know how to what that word means and how to tie it into ECO 101.

8:44  
OK.

8:44  
First version is cap and trade.

8:46  
Honestly, if you remember the Coda module from Coda Part for market interventions, it's pretty much the same thing in here, just relabeled.

8:55  
OK, so the difference is going to be there.

8:59  
We gave you an arbitrary quota and we just told you it was binding here.

9:04  
We're going to give you a little bit more reasoning for why we choose that quota, why it's binding in here, and all of it is going to be tied to externalities.

9:13  
OK, so here's the problem with externalities.

9:15  
We want a certain amount of pollution, OK?

9:19  
There's too much pollution and this is right now the quantity of pollution in the market, OK.

9:25  
And we are saying that that's too much pollution causes a negative externalities markets over produce.

9:31  
So I want to reduce the amount of pollution, I want to lower the quantity, I want to impose a quota.

9:37  
This quota necessarily is going to be binding because without this quota we would be here, right, the market.

9:43  
But the problem is the market is over producing.

9:45  
So I'm going to put in a binding quota, but now I'm giving you a reason for why we have this binding quota.

9:50  
It's because the market is over producing relative to efficiency.

9:54  
Now the way they're going to implement this is going to be similar to how we thought about in quotas.

9:57  
OK, there is a permit, there's a golden ticket and only if you have this permit can you pollute 1 unit of thing.

10:05  
OK, so that's the cap part.

10:09  
Now, one of the things that we talked about very briefly in the quota aspect is what happens if you allow people to trade these golden tickets, OK, you get the golden ticket, somebody else gets the golden ticket.

10:21  
There's a third person who doesn't get a golden ticket.

10:23  
If you allow people to buy and sell these things, does it change anything in here?

10:28  
And we kind of came to a conclusion in the quota part was that allowing trade increases efficiency because it allows for a better allocation.

10:37  
So we'll briefly bring that up in here.

10:39  
So we'll examine caps, caps and pollution and then we'll say how allowing for that extra margin, which is trading permits, has an extra efficiency boost in in that it helps with allocation issues.

10:52  
OK, So now I'm not thinking about the auto market or the OR the chemical market separately.

10:58  
I'm pooling everything together.

11:00  
I'm really thinking about the pollution that's the problem.

11:02  
Problem is pollution.

11:04  
And I directly want to think about the quantity of pollution in there.

11:09  
OK, now cost of pollution, it's not on any individual person.

11:15  
There is a cost and pollution for society.

11:17  
So let's think about the only cost of pollution coming from a social cost of pollution.

11:22  
OK, that's the externality kind of aspect in there.

11:25  
So pollution imposes a cost on society.

11:29  
When there's a cost, is there a benefit to anybody in here?

11:32  
We're going to say there is a benefit and there's a social benefit to pollution.

11:37  
And you're going to say, well, pollution should have no benefit.

11:39  
Well, if you think about it from the firm's perspective, they're not polluting for any reason, right?

11:44  
It's not because they they like pollution and that's why they're focused on pollution.

11:47  
They're doing pollution because it's convenient.

11:49  
It allows them to do things in a certain way.

11:52  
That allows them to increase their profits, right?

11:55  
And producers are part of society, right?

11:58  
So when we're thinking about marginal social benefit, really I want you to think about the benefits of pollution.

12:04  
Sometimes that shows up as reduced cost of production, whatever it is, whoever's getting that benefit to society, that's the social benefit to society from pollution.

12:13  
So if we want to figure out what's the optimal amount of pollution, this is the efficient amount of pollution.

12:21  
OK, social benefits, social cost.

12:24  
In a perfect world, that's how much pollution there would be, not 0 pollution because, you know, some pollution has some benefits to somebody, but not an infinite amount of pollution.

12:34  
Now, what would be the market outcome?

12:36  
The market outcome would be the amount of pollution that would result from private costs and benefits.

12:45  
And what we've just said is, look, there's some private benefits.

12:47  
I mean, really, if you want to think about this as being only firms, that's fine.

12:50  
Think about this as being only firms.

12:52  
OK, there's some private costs, private benefits from releasing pollution, lower production process costs, whatever it is.

12:58  
But that's the private benefits.

13:00  
Now, if there's a firm who's emitting pollution, what's the cost to the firm of polluting if there's no regulation of pollution, no laws, no nothing, no price of pollution, Their effective cost of pollution is not the same as a social cost, right?

13:20  
And in fact, without any regulation, you can kind of reasonably assume that the cost of pollution for a firm, the private cost of pollution is 0.

13:30  
So if I'm just going to put the private costs and benefits in there, then without any interventions, this is how much markets will pollute.

13:38  
This will be the quantity of pollution in the market.

13:42  
OK.

13:43  
So we are going to impose what we call a binding code.

13:46  
We're going to impose a maximum amount of pollution that is lower than the market quantity, but we're choosing it because this is the efficient amount of pollution.

13:56  
So we're going to cap it.

13:58  
Our cap on pollution is going to say that you can only produce this amount of pollution.

14:04  
And then how do you pollute?

14:05  
The same way as we did with the quota.

14:06  
If you get 1 golden ticket, you have the right to pollute 1 unit.

14:11  
Now the trading part comes in, in the how do we allocate these golden tickets?

14:16  
I could take them and I could just randomly give them out to polluters, right?

14:21  
But the problem is, some polluters who don't have a very high benefit from pollution get the golden ticket at the expense of someone in there who has a lower cost.

14:35  
Sorry, a lower benefit?

14:38  
No, let's take a step back.

14:40  
I'm going to randomly allocate tickets to producers.

14:44  
Every producer wants this golden ticket because polluting gives them some benefit.

14:49  
When I randomly allocate these tickets, it could be that someone with a low marginal benefit of pollution gets the ticket at the expense of someone with a high marginal benefit of pollution.

15:03  
Reallocating this golden ticket from someone with a low benefit to a high benefit will increase surplus.

15:10  
We don't see this on the graph because this graph is already implicitly arranged them from highest to lowest marginal benefit and implicitly assuming the highest benefit people get that.

15:21  
OK, So what we do in most of these cases, and we've seen this explicitly with the quota aspect, is we allow these people to trade.

15:29  
We say you get the golden tickets, but please trade among yourselves.

15:32  
And then what we see is that trading golden tickets, OK, allowing people to trade golden tickets reduces misallocation.

15:48  
If I have a high benefit and you have a lower benefit, there's potential for us to make a trade and the ticket moves from the low benefit to the high benefit, right?

15:55  
But then we can reduce that misallocation.

15:58  
So a cap is going to say only these many units of pollution and a trading aspect in there moves the tickets from the low benefit to the high benefit firms in this case.

16:09  
Now our total surplus and I don't care about allocation of surplus.

16:12  
Our total surplus will just be social benefits, social cost and a binding correctly chosen cap will implement the efficient outcome.

16:24  
So this is the thinking behind cap and trade.

16:26  
Cap plus trade gives us efficiency.

16:29  
You remove the trading aspect, you have some inefficiencies coming in due to allocation issues in that.

16:36  
That is cap and trade in a nutshell, right.

16:38  
It's taking everything we've done in the quota aspect and just relabeling it to apply it to externalities, and it's giving you now an explicit reason for why we would have a binding quota 2.

16:52  
It's showing you that in the presence of externalities, an intervention that was previously deadweight loss causing can help us get to the efficient outcome if we choose it correctly.

17:04  
Now let's focus on version 2.

17:06  
So before there was this golden ticket and we're like, oh, you figure out the price, you figure out trades by yourselves.

17:12  
What about if the government decides to just say, forget about a golden ticket, You want to pollute.

17:17  
You can pollute, but here's the price of pollution.

17:20  
OK, so no golden tickets, but every unit that you pollute, you've got to pay a pollution price.

17:26  
OK, now we're going to do that, but our focus is going to be on this reallocation aspect.

17:32  
OK, who is going to be the one who should release reduce pollution?

17:36  
Why would they reduce it?

17:37  
And so on.

17:39  
So we look at society to think about the social benefit and the social cost of pollution in order to find the optimal amount of pollution.

17:52  
Suppose we are thinking about this as pollution reduction.

17:59  
OK, everything in here is going to be I want to reduce pollution.

18:05  
If I'm going to reduce pollution, I have to think about what's the benefit to society from reducing pollution and what's the cost to society benefit of society if there's no pollution, how can we think about a benefit, right?

18:21  
Because typically we think about benefit when we have this extra unit.

18:24  
So what does it mean to not have something and still have a benefit?

18:28  
The insight is coming from the fact that if you don't release this pollution into the atmosphere, you reduce pollution, you're saving that cost that would have been imposed on society, right?

18:40  
So the benefit of reducing pollution to society is the externality cost that is no longer being imposed on society.

18:49  
You're saving that cost of external, the external cost.

18:53  
OK, so the social benefit at the margin of reducing pollution is the externality that would have been imposed should that unit have not been reduced.

19:04  
What's the cost of reducing pollution?

19:08  
Again, we're gonna ask who's reducing this pollution here?

19:10  
In our simple world, firms are reducing pollution.

19:13  
OK, so if firms are going to reduce pollution, then it's gonna be costly to them cuz they've got to adopt agree more expensive technologies.

19:20  
There's a reason why they were not reducing pollution before.

19:22  
It was cheaper not to reduce pollution.

19:24  
So if you want them to reduce it, it means that they have to pay a cost.

19:27  
And that cost in here is what we're going to call the cost to society.

19:33  
So in a certain sense, I'm really thinking about social cost and private cost of reduction as being the same because that's coming from the firm side and the cost that they need to pay in terms of their production processes.

19:51  
So we're asking how many units should be reduced.

19:54  
Again, I'm thinking about here's what we have, we have all of this pollution now I want to reduce it.

20:00  
How many units?

20:01  
Well, I want to reduce the pollution for all of those units for which the benefit to society at the margin is at least as high as the cost of society.

20:11  
If you think about some units of pollution at really high cost, it would take so much money to invest in so much of green technology that some units, it's just better for society, just have that extra pollution in here.

20:21  
But if there's some units for which benefit of reduction is at least the size of cost, then you want to reduce that same exact same concept that we've been working with from unit, from unit 1.

20:32  
The only difference here is it's phrased as reduction.

20:34  
So for you, the hardest part is going to be this aspect.

20:38  
If you wrap your head around that aspect, everything else just follows pretty much the straight to straight from what we've done in previous modules, OK.

20:48  
So if a firm wants to reduce pollution, it's got to pay money.

20:53  
And we're going to call this the marginal cost of reduction, OK, What is the benefit from reducing pollution?

21:01  
Firms have to have some benefit.

21:02  
There's no benefit then they're not going to reduce it, right?

21:04  
Because from a firm's perspective, I'm looking at private costs and private benefits and then I'm going to choose how many units to reduce and then take a step back and say do this quantity at all.

21:17  
So if we want to think carefully about how many units they're going to reduce their pollution by or how many units will be a bit, I need to think carefully about this cost benefit analysis.

21:28  
So what is the benefit to the firm from reducing pollution?

21:34  
So this is the quantity of pollution.

21:37  
I'm keeping it the same thing in there, right?

21:41  
And in here I want to phrase it as reduction.

21:45  
Everything is reduction.

21:47  
Reduction.

21:48  
OK, so this is not just quantity of pollution.

21:51  
I'm reframing that to think about quantity of pollution reduction, number of units that have been reduced or no longer happen.

22:03  
So I'm going to take the private cost of reduction, arrange them in a usual way.

22:07  
Well, if I had to reduce it, I would reduce the lowest cost unit and then kind of go up from there.

22:12  
I need to have the firm's marginal benefit from reduction.

22:19  
This is a firm.

22:22  
If pollution is free, then the firm will be here.

22:33  
Nothing.

22:34  
They're not gonna do anything about reducing pollution.

22:37  
If you want to make them reduce pollution, you need to give them some benefit.

22:43  
You somehow need to move the marginal benefit of reduction up.

22:49  
Now what's the benefits to a firm from reducing pollution?

22:52  
You can either say I'm going to pay you reduce pollution and I'll give you some money.

22:58  
That's one way.

22:59  
So marginal benefit of reduction is you can have basically a price or a payment, a per unit reduced payment.

23:17  
And that can get kind of complicated, right?

23:19  
I've got to go to each firm, figure out all of this, reduce it.

23:23  
Or you can frame it in the same way that we framed it in the previous way, as money saved.

23:30  
OK, so if the firm polluted, it has to pay a price for pollution, OK, it has to pay a pollution price.

23:45  
If it chooses to reduce pollution, it saves the payment.

23:56  
They would have paid for pollution.

23:59  
OK.

23:59  
So the benefit of reducing pollution is the pollution price saved.

24:15  
They're both kind of the same thing.

24:17  
One is you're giving them direct subsidy.

24:19  
The other is you're saying, you know what, it's a good deal for you because you're saving the payment.

24:22  
So instead of me giving you money, you're just choosing to reduce it because you're saving that money.

24:27  
OK.

24:27  
So then what I introduced here is a pollution price, so a pollution price per unit.

24:38  
So you can think about this as a per unit pollution price, OK, Which is also to the firm the marginal benefit of reducing pollution.

24:49  
In that case, how many units will the firm choose?

24:52  
You know exactly what it's gonna choose.

24:53  
This will be the quantity of pollution reduced, First one.

25:01  
I save lots of money on that first unit of pollution reduced.

25:03  
I don't have to pay this high price.

25:05  
It doesn't cost me much.

25:06  
I'll do it.

25:06  
I'll do it, I'll do it.

25:07  
Until that certain point you're like, oh, reduce the extra pollution.

25:10  
I'll be like, it's really costly for me to do.

25:12  
So I'd rather just pay the price for pollution and pollute.

25:15  
OK, that is how a pollution reduction decision works.

25:21  
Now that's really nice for us, because if you're asking what price of pollution should the firm choose, no surprises in here.

25:29  
The price that you should choose as a government right, The optimal, the efficient price.

25:38  
I use the word optimal price for pollution should be the marginal social cost of pollution.

25:53  
OK, makes sense.

25:56  
Because what you're doing here is you're saying that I want the firms to choose the right quantity of pollution reduction and I want to have the cost to society, which in this case would be the cost of reducing pollution, marginal cost to society, social cost of reduction.

26:16  
This is the benefit to Society of pollution reduction and the benefit to society go back a few slides, is the externality cost of pollution that would have been imposed should that unit not have been reduced.

26:38  
So that's the insight we're bringing in here and we're like, oh, just pick that in, pick that to be a pollution price.

26:44  
Now if this external cost was the same everywhere, then fine, I would have no problems.

26:51  
I wouldn't think too much about what it is, but if it varies along, you know, one unit of pollution reduction, 2 units of pollution reduction, then in that case you should have this to be the marginal external cost of pollution at the efficient quantity.

27:10  
Same insight coming in from the Pigouvian tax, same thing, just it looks different because we're framing it slightly differently.

27:17  
OK.

27:17  
So abatement reduction, both of those words.

27:20  
If you don't like the word abatement, drop it wherever it is and think about it as reduction, OK.

27:26  
If we want firms to start reducing pollution, we need to pay attention to their cost benefit analysis, cost of reducing pollution, changing technology.

27:36  
The benefit to reducing pollution is that they save the price of pollution.

27:42  
OK.

27:42  
This is the social, the the private benefit of pollution reduction to the firms.

27:51  
That's what they save by reducing pollution.

27:54  
If you're choosing the right price, you will make sure that you choose the price to be the marginal cost imposed, the marginal external cost imposed on pollution, OK, but not just anyone at the efficient quantity.

28:11  
If you do that, then you're going to set marginal social benefit equals marginal social cost of pollution reduction, and you're going to implement the efficient amount of pollution reduction.

28:32  
So here's what we've done.

28:33  
In order to solve the externality problem, we need to get people to internalize their impact.

28:39  
OK, social norms help because they help people putting non explicit costs and benefits into their calculation.

28:48  
They're not explicit in the sense that there's not an actual price that they pay, but it's something that they care about.

28:52  
It's a cost or benefit imposed on them that changes their behavior.

28:55  
It's really hard to do on a large scale.

28:58  
What we can do is impose things like cap and trade.

29:01  
A cap is good because it says only this amount of pollution should be reduced.

29:06  
A trade layered onto a cap is even better because it gets the pollution permits into the right hand and allocates it efficiently.

29:16  
Reduces the misallocation problem.

29:18  
All of that comes in from the quotas aspect of what we've done before.

29:22  
Pollution pricing is rephrasing this, but putting the explicit thing into why firms would reduce pollution and looking at a firm's costs and benefits of producing of pollution reduction.

29:35  
Changing the thing from polluting to reducing pollution just means we have to work a little bit harder to think of explicitly about what the costs of pollution reduction and what the benefits are for the firm and for society.

29:48  
But once we do that, it fits neatly into our framework and we can kind of think about using pricing, a market mechanism, A pollution price that implements the efficient amount of pollution reduction and make sure that the lowest cost units are the ones that are being reduced.

30:06  
And also we don't have any misallocation.