**W11 V2 Cournot Competition**

0:10  
In this video, we're going to focus on Corona competition and we're going to talk about the strategic interaction and how it affects the marginal revenue curve.

0:17  
More specifically, once we have that, we can talk about best responses and equilibrium and then compare it to our best case scenario, which so far has been perfect competition.

0:28  
Corner competition.

0:30  
Firms choose quantities at the same time.

0:32  
The reason it affects the strategic interaction because total quantity in the market sum of both firms effects market price and that's the same price for both firms because goods are identical, right?

0:43  
So they will be charged the same price, which is the market price determined by quantities.

0:48  
Now given firms A's quantity choice, right, the resulting market price will be determined by what firm B's quantity is at the same time because we sum them up to get total market quantity.

1:06  
This is sounds really vague, so let's think about this in terms of an example.

1:10  
So at the top here, I have the market demand curve.

1:13  
So for any given price, I will tell you what the quantity demanded in the market is.

1:19  
And we'll do a calculation to talk about the general strategic interaction that we have seen in the previous video, specifically focusing now on marginal revenue.

1:28  
OK.

1:28  
As a reminder, marginal revenue is the change in revenue by selling one extra unit, OK.

1:35  
So here I've got the same choice of A, which is to provide 2 units.

1:40  
That's not changing, but what we are looking is across kind of the payoff matrix in a certain sense.

1:45  
What happens with different choices of firm B.

1:49  
So when firm B chooses 1 unit and firm A chooses 2 units because that's what we're keeping here, the market quantity will be 3.

2:01  
My same choice of two for firm A will determine market price in a different way.

2:08  
Because if firm B chooses 3 instead of one, I'm going to get a market quantity of five.

2:14  
Different market quantities are going to result in different market prices.

2:19  
So if there is a quantity of three, market price here is going to be 60.

2:25  
If market quantity is 5, market price will be 40.

2:28  
So here you can kind of see why firm A cares about what Firm B does because it affects the market price.

2:34  
Now let's think about the marginal revenue in here.

2:37  
So now I'm thinking about Firm A only Firm A changing its quantity choice by 1 unit marginal revenue.

2:49  
So I want to think about two going to three.

2:52  
So firm A is selling 3 units and it used to sell 2 units.

2:58  
OK, same change in quantity.

3:01  
I used to sell 2, now I'm selling 3.

3:04  
When I increase my quantity by one, I'm changing market price.

3:10  
OK, so if I'm starting out with one unit of B and I'm adding on one more unit for mine, so I'm going from 2:00 to 3:00.

3:20  
Market quantity is now going to go from 3:00 to 4:00, which means that market price will go from 60 to 50.

3:31  
So when I increase my quantity As for me by 1 unit, I'm now selling all three of my units at a price of 50.

3:39  
I'm affecting market price if I'm affecting my revenues and before when I sold only two units, market price was 60.

3:47  
So this is going to be my marginal revenue.

3:50  
OK?

3:50  
Where it is holding fixed is the quantity of B.

3:53  
This is held fixed, not changing the other person's choice.

3:57  
Given the other person's choice, if I increase my quantity, what is my change in revenue?

4:02  
Similarly, if I increase my quantity from 2-3 to two when the other firm is choosing 3 and I'm holding that fixed, I am now moving from a market quantity of five to a market quantity of 6, which means that price is going to go from 40 to 30.

4:25  
So now I'm selling 3 units at a price of 30, when before I was selling 2 units at a price of 40.

4:31  
That is my marginal revenue.

4:34  
You put in the numbers, you're going to see that the marginal revenue is going to be different in those two circumstances.

4:43  
I'm still looking at the same thought experiment.

4:45  
I'm still looking at a thought experiment where I'm going from 2 units to 3 units, right?

4:51  
Same 2 units to 3 units, same 2 units to 3 units, right.

4:56  
But the reason my marginal revenue is different across those two scenarios is because the starting point is different, the starting price is different.

5:05  
And that depends on what the other firm is doing.

5:08  
If the other firm happened to be doing 1 unit or producing 1 unit, then my change in price is from 60 to 50.

5:16  
If the other firm happened to be 3 units and holding that fixed, the price changes from 40 to 30.

5:22  
That is what's going to affect my marginal revenue.

5:24  
Once I have that, then I can think about best responses and equilibrium.

5:29  
OK, so given Firm B's quantity choice, I can back out for every quantity choice of mine as Firm A what my marginal revenue is.

5:40  
You do the same thing that we just did, except you're looking at 2 to 3, zero to one, one to two.

5:45  
All of my quantity choices.

5:47  
I figure out my marginal revenue.

5:49  
Then I scan down the column to find the best response, which is the one where marginal revenue equals marginal cost.

5:58  
So that marginal revenue versus marginal cost, that's principle two.

6:01  
We're keeping that.

6:02  
We're not changing that.

6:03  
All we're doing here is saying think carefully about marginal revenue because here it depends on market power and it depends on the other firms quantity choice and we've gone through that whole exercise.

6:14  
OK.

6:14  
Once I figured out A's best response, I can figure out B's best response to every choice of A.

6:20  
Put them together, use that payoff matrix or use equations in the second year and you can figure out Nash equilibrium.

6:27  
But I really want you to focus on the intuition here that the reason one firm cares about what the other firm is doing is through marginal revenue.

6:37  
Now let's explore this further with the same example.

6:42  
And what I'm going to do here is now think about monopoly versus not.

6:48  
So this is 1 starting point.

6:52  
OK, I'm also going to change it in a certain sense that I'm now thinking about continuous data.

6:58  
So the previous example was discrete data.

7:01  
You also need to be able to work with continuous data.

7:03  
OK, now continuous data is useful because I can quickly calculate what the monopoly quantity is, perfect competition quantity.

7:12  
All of that is really quick given all of the previous modules, right?

7:16  
So you're noticing in 101, every extra module builds on those previous modules, and you've got to pull stuff in there.

7:21  
So if you've got any gaps, now's the time to start fixing them.

7:24  
OK, so from previous modules, given a price quantity relationship, given a demand curve, given a cost curve, I can figure out what the monopoly quantity is.

7:36  
Now the problem is I've got 2 firms in here.

7:37  
So is the monopoly quantity different or not?

7:39  
I've made your life really simple and said both firms are really identical.

7:42  
OK, so whether one firm is a monopoly 2 firms, the monopoly doesn't matter.

7:46  
Monopoly quantity in this world is 8.

7:49  
OK, so if I have a limited amount of competition and firms are choosing quantities, does that mean I'm going to result in the monopoly outcome?

7:57  
So that's the question we're asking here is the monopoly outcome and equilibrium.

8:03  
Now a monopoly outcome is 1 firm.

8:04  
What does it mean to have two firms?

8:06  
Well, what we're gonna do is to say whatever they do, the sum has to be the monopoly quantity.

8:12  
Now should it be 1 from producing 8 and the other from producing 7?

8:16  
It can be anything.

8:17  
What we typically do in this case is just assume that they're splitting it.

8:20  
It's just to make our lives really simple.

8:22  
OK, so the simple version is that one firm produces 4, the other firm produces 4.

8:28  
Together they produce 8, which is the monopoly quantity, and we get the resulting monopoly price based on the monopoly margin.

8:37  
Now I care about one firm separately because I'm looking at their incentives.

8:40  
So what is that one firm's revenue price times quantity?

8:45  
Except notice it cannot be the monopoly quantity, because the monopoly quantity is 8.

8:50  
But my quantity that my firm is producing is 4.

8:55  
OK, so this is revenue for firm A because our identical is also going to be revenue for firm B.

9:01  
But let's focus on firm A.

9:03  
OK, now that's our starting point.

9:05  
So to figure out if something is in equilibrium or not, I have to see whether anyone has an incentive to deviate.

9:12  
So we're going to use that intuition here.

9:14  
If firm B stays with four, if we expect from B to produce four, do I have any incentive to deviate?

9:25  
Do I want to produce four or do I want to produce more or less?

9:29  
So what I've done here in this column is to say, what if I want to produce more?

9:32  
Is that a profitable deviation?

9:34  
Does it increase my profits or not?

9:36  
OK, if I was a monopolist, clearly not, because a monopolist would want to stop at 8:00.

9:41  
But I'm not a monopolist in here.

9:43  
I'm an oligopolist.

9:44  
And also I'm not producing 8 units.

9:47  
I'm going from 4:00 to 5:00.

9:50  
OK, so let's do the same thing we did on the previous slide.

9:54  
Quantity is going to be the sum of both of those.

9:57  
So market quantity is going to be 4 + 5.

10:00  
Now I've got to figure out what the market price is going to be.

10:03  
So I'm going to plug this quantity in here to get market price.

10:12  
OK, notice when I choose to produce more, the other firms, things stay the same.

10:18  
Market price will go down South.

10:20  
This is the new market price.

10:22  
What I've got to figure out is the change in profits.

10:25  
I first need the change in revenue.

10:26  
OK, so what's my change in revenue?

10:29  
My change in revenue here is going to be I used to sell 4 units and when I sold 4 units the price was $60.00.

10:38  
This is my old revenue.

10:40  
Here's my new revenue, which is, sorry, let me put that here because that's the change in revenue that I'm talking about.

10:51  
My new revenue is going to be my new price times my new quantity, which is 4 plus the extra 15, OK.

11:01  
So this is going to be my change in revenue.

11:06  
Is it going to make me want to produce more or less now for a monopolist?

11:13  
We said this was a monopoly because for a monopolist this is where marginal revenue equals marginal cost.

11:24  
OK.

11:25  
So at least for the monopolist, I knew that the marginal revenue at a quantity of eight was 20 because otherwise they wouldn't have stopped there, right?

11:40  
They would have kept going for a monopolist either up or down.

11:44  
So what was the marginal revenue in here?

11:46  
You can figure out the number, but before we figure out the number, let's think about the price effect and the quantity effect.

11:53  
So when I raise my quantity from 4:00 to 5:00, I'm selling an extra unit and I'm getting $55 for that.

12:03  
That's straightforward.

12:05  
The quantity effect is pretty straightforward because it's an extra unit to get the market price.

12:09  
The trick comes in in the price effect.

12:11  
So the price effect says when I increase my quantity, the price is going down by $5, right?

12:16  
So that's a bad thing for me.

12:18  
And I lose $5 on every unit that I produce and continue to produce.

12:24  
So I used to produce 4 units.

12:25  
Now I'm producing 5 units.

12:27  
So those first four units I used to get 60, I'm getting only 55.

12:31  
I'm losing $5 on that.

12:33  
What makes this different from the monopolist is that the monopolist is not calculating price effect for the four units that they sell.

12:45  
The monopolist was selling 8 units.

12:48  
So the fact that this corner firm, this firm engage in quantity competition is selling less than the monopoly quantity, that is what's going to make its price effect lower than the monopolist.

13:00  
In that case, a lower price effect, because remember, the marginal revenue is the price effect plus the quantity effect.

13:12  
You're going to make the price effect lower because I'm selling a few units, I don't bear the full burden of the price decrease.

13:19  
Then your firm here has an incentive to deviate from the monopoly quantity, right?

13:25  
So the monopoly is not going to be in equilibrium because one firm has an incentive to deviate if the other firm is going to stick with the monopoly quantity, right.

13:35  
So we know we're not going to be at monopoly outcome.

13:37  
We're going to be a higher quantity or a lower price than the monopoly outcome because of this incentive to deviate for the monopoly.

13:45  
OK, fine.

13:45  
So we're not at this really high monopoly price.

13:47  
We're going to be at a lower price.

13:49  
Does that mean we end up all the way in perfect competition?

13:51  
Well, let's check.

13:52  
OK.

13:53  
So the other thought process is to say, well, what's the perfect competition price?

13:58  
You know that already from your previous modules, right?

14:00  
Given my demand curve, given my marginal cost curve, this is the perfect competition.

14:05  
How do they produce that?

14:06  
It's complicated.

14:07  
So let's just assume that they split it.

14:09  
OK, fine.

14:10  
So that means each firm is producing 8 and my individual firm A when the market price is 20 is getting this because it's producing 8 that as revenue.

14:21  
Now what if it wants to deviate?

14:22  
Now deviate can be producing one more or deviating can be producing 1 less since we've done one more on the previous slide, let's do that quickly here and then think about what happens when you produce one less.

14:32  
OK, so now it was 16, my market quantity is going to be higher, it's going to go to 17.

14:38  
Market price, similarly will be lower.

14:45  
OK.

14:46  
And revenue, I'm going to think about the revenue.

14:49  
I used to sell 8 units.

14:51  
Now I'm selling 9 units and I am getting $15.00 for each one of those units.

14:57  
What is going to be my change in revenue?

15:00  
It's actually, I'm going to lose money in here.

15:02  
I'm going to be getting $25 lower in terms of revenue.

15:06  
Why?

15:06  
Because selling that extra unit going from 8:00 to 9:00, OK, has lowered the price so much that I'm actually in that having a price effect that's so large, that's overwhelming the quantity effect.

15:20  
And I'm in negative revenue.

15:21  
If my revenue is going down because my profit is revenue minus cost, producing the extra unit is reducing my revenue.

15:31  
And also, I've got to sell more, produce more, cost more.

15:38  
That means that my profit is going to go down.

15:39  
There's no way this firm wants to deviate and produce more.

15:43  
If they're starting off from splitting the perfect competition outcome, do they want to produce less?

15:49  
That's not a profitable deviation.

15:50  
We want to check if we want to produce less.

15:52  
OK.

15:53  
So now I'm going to go from producing 8 to 7, follow the same process and you're going to get now a change in revenue of 15 and you're going to be like, OK, good, fine, It's not negative, but it's 15 and my cost is 20.

16:08  
Do I still want to deviate here?

16:10  
You want to think about what happens when you're producing less?

16:13  
OK, so my profits on my revenue minus the cost, OK.

16:19  
If I'm producing less, what's happening here?

16:23  
My quantity goes down.

16:26  
Revenue here is going up by $15 and costs, I'm producing less, I payless in cost, costs are actually going down.

16:33  
So this means that my profits are actually going to go up.

16:36  
It's a profitable deviation.

16:38  
So if they start out by assuming that they're going to split the perfect competition outcome, they don't want to stay there.

16:45  
Because if the other firm is going to stay there and produce 8 for me, it wants to deviate and actually produce less.

16:52  
So Corona is gonna end up somewhere in between.

16:54  
It's not gonna be a high price or resulting price as a monopoly or as low as a quantity as a monopoly, but it's not gonna be as high a quantity and as low as a price is perfect competition.

17:03  
It's gonna be somewhere in between.

17:05  
OK, so this happens because the price effect for a firm competing by choosing quantity, given that they sell less than the market quantity, the price effect is lower.

17:17  
That gives them an incentive to deviate and produce more than the monopoly quantity.

17:21  
OK, so we're going to get a larger quantity relative to the monopoly, but we're not going to end up all the way in perfect competition because that's too much, right?

17:29  
We're going to back up if we are perfect competition and end up somewhere in between.