**W11 V3 Bertrand Competition**

0:09  
In this video, we're going to focus on Bertrand competition and do exactly the same thing that we did for Cornell.

0:14  
What are the strategic interactions here?

0:16  
What's best response?

0:17  
Nash equilibrium?

0:19  
And then compare it to the perfect competition outcome in Bertrand.

0:24  
They're choosing their prices, they're choosing it at the same time.

0:26  
That's what we're focusing on in one O 1.

0:29  
The market price will just be the lowest price that every firm produces posts.

0:35  
Why?

0:35  
That's because consumers treat these goods as identical.

0:38  
They just want to go to the cheapest one and they have these huge responses.

0:42  
Now that's going to show up as Firm B's price given.

0:48  
If we take that as given, Firm A cares about what that price is because the number of consumers that they get is affected by what the other firm posts.

0:58  
The number of consumers matters because profits.

1:01  
But we're really focusing on revenues.

1:03  
Revenues here will be price times quantity.

1:07  
So while I can control my price by my choice in here, this is not a choice variable for me in that sense that this depends on what the other firm does.

1:22  
OK.

1:23  
So that's the channel that we're looking to look at.

1:24  
We in corner, we focus on the quantity side.

1:27  
And here we're going to focus on price, but it's still going to come through the revenue side because the number of consumers which effects my revenue is affected by what the other firm does.

1:35  
So let's think about that a little bit.

1:36  
If firm B chooses a given price, if firm A chooses to match that price exactly, right, exactly, then consumers don't care who they buy it from.

1:46  
They can show up from A, from B, doesn't matter.

1:49  
For simplicity, we're going to assume that they split it, OK.

1:52  
So if you produce, sorry, if you choose Pennsylvania, your revenues in this case will be price A, which is also the market price because the other firm is exactly the same times the quantity for A.

2:09  
And the quantity for A will be 1/2 the market quantity at price Pennsylvania or PB.

2:18  
OK.

2:18  
So those are your revenues in that.

2:20  
That's what you care about.

2:21  
What about if you post a price that's slightly higher than the other firm?

2:27  
In that case your sell nothing, right?

2:31  
Your quantity for B will be exactly equal to 0.

2:35  
So forget about any revenues because whatever price you're posting, you're like, oh I'm posting this high price, that should be my revenue.

2:41  
It doesn't matter because you're selling nothing, right?

2:44  
So your revenues are being affected by the other firms choice because if you post that higher than that, your price happens to be higher than that, your revenues are zero.

2:53  
OK, now what about if the other firm posts a price and you choose to post lower than that?

2:59  
In that case, your revenues will be your price, OK, times the market quantity because you're selling everything at your price, right.

3:11  
So your revenues are going to be huge because you're selling the entire market in here.

3:16  
Again, it's coming through revenue.

3:18  
The revenue side is what we're going to be focusing on that affects your best response.

3:23  
OK.

3:23  
So let's think about a best response.

3:26  
And there are many ways to do this.

3:27  
I'm just going to do this graphically.

3:28  
So graphically, here's what I'm going to do.

3:30  
I'm going to say these are all possible choices of firm A, right.

3:37  
They can choose any possible price.

3:40  
So firm B has equivalent.

3:43  
So let's put it in here.

3:44  
Firm B is never going to post anything like 0.

3:47  
Why would you ever post a negative price, right?

3:49  
And firm B can post any price from zero all the way up to Infinity.

3:56  
I've got to figure out Firm A's best response to any particular choice of Firm B.

4:02  
So let's make this Firm B's choice.

4:05  
It can be anywhere.

4:06  
Let's take that as given.

4:10  
And what we have to do is to figure out firm is best response.

4:16  
OK, so putting this vertical line in here allows me to think about any price.

4:20  
What's the best response?

4:21  
Any price, What's the best response?

4:22  
It's kind of a quick way of combining all of that information in the matrix and using thinking to convey this in a faster way.

4:29  
OK.

4:29  
So here are some information, piece of information that we want to use with this demand curve with two identical firms with our cost.

4:37  
Those are going to be the monopoly price and perfect competition price.

4:40  
OK, let's keep that at the back of our heads.

4:42  
OK.

4:43  
Now one thing that's going to be important for Firm A is its cost.

4:49  
If it's cost of production is $20.

4:53  
OK, And now you're thinking what price should I post if firm B happens to post a price that's below $20, right?

5:01  
Let's say 19.

5:02  
Pick any price that's below $20.

5:05  
You're going to say if I post 19, I'm going to sell something.

5:09  
But if I sell something, I'm selling something that's less than my cost.

5:13  
If I post anything below, I sell nothing, which is good because I don't want to sell anything with my revenue is going to be less than my cost.

5:20  
So if I had to ask you, what's your best response when the other firm is posting a price that's below your cost of production, you're gonna say my best response to anything that's there is going to be either to post a price that's below the other guy, so then I'm sure nobody comes to me, sorry, above the other guy.

5:44  
So then I'm sure nobody comes to me, OK, Or post a price of 20 so that even accidentally, if someone accidentally clicks on buy, I'm not losing any money.

6:00  
If I happen to say, oh, I'm going to post 19.5, I'm still going to lose money right now.

6:05  
You can do it either way.

6:06  
Both of those ways will be fine.

6:08  
We tend to stick with this one just because it's easier to kind of conceptually think about a firm that's never going to post a price that's anything below its cost.

6:16  
Because even if the other phone posts it, they don't want to post anything lower than that, so that even if accidentally someone shows up, then they do that.

6:24  
But again, don't think too much about it, whichever one you find easier to do that.

6:28  
I'm sticking with this one here just because it's easier for me in terms to think about, but both of them will result in exactly the same thing.

6:35  
OK, good.

6:36  
Now what if the other firm posts exactly $20?

6:43  
OK, if you post $20.01, you're getting nobody.

6:47  
If you post 1999, you're going to get people, but you're going to lose money.

6:52  
So what do you want to do?

6:52  
Get nobody?

6:53  
If you post higher, get everybody, but lose money when you post lower, what happens if you produce exactly a 20 and you because you're posting exactly the same price.

7:04  
If you're posting exactly the same price, you're going to get a quantity that's exactly half the market quantity.

7:11  
And you're going to be like, oh, that's good, right?

7:13  
Because selling something is better than not selling.

7:16  
Well, selling something here, you're going to sell it at exactly cost.

7:20  
And you're going to make 0 profits.

7:22  
And you're going to be like, well, if it's zero profits, why should I post anything?

7:25  
Because remember, 0 profits for us is 0 economic profits, and you're making at least as much as your next best option.

7:31  
So why don't produce?

7:32  
Right.

7:33  
So in this case, your best response is to choose 20 because you get 0 profits.

7:39  
But producing is better than not producing because at least you're making your outside option.

7:44  
What about if firm B posts a price that's higher, let's say $25?

7:51  
In that sense, you're like, look, if I post above 25 and one cent, nobody's coming to me.

7:57  
If I post exactly 25, right?

8:00  
It's good because I'm gonna get, you know, this higher than my cost.

8:03  
My cost is 20.

8:04  
I'm gonna get higher than that, but it's better for you to post a price that's below him.

8:11  
You undercut him, you do 2499 and you're gonna go from getting half the market to the entire market.

8:17  
This huge swing in the quantity effect, going from half the quantity to suddenly selling the entire market just by changing a price by 1 cent price effect is really tiny.

8:27  
Just a one cent change quantity effect.

8:29  
You go from half the market to double the market.

8:31  
That's huge.

8:32  
That's a huge incentive to undercut.

8:34  
That's what's going to give us all of the results in Bertrand think this huge incentive to undercut because of this dramatic swing in the quantity effect.

8:42  
OK, so it seems like anything above here, you're going to want to just post a price that is just a teeny tiny bit below the other guy.

8:57  
OK, so you say, oh, post a teeny tiny bit that's below the other guy.

9:01  
Now you can write this as one cent and that makes sense for us because we can only go and kind of increments of 1 cent.

9:07  
Typically we write this down as epsilon teeny tiny bit.

9:11  
So if it is possible to post 0.0001 cent, that's where I want to go.

9:15  
I want to go as small as possible.

9:17  
So shorthand version of that is to kind of think about this as epsilon A teeny tiny bit.

9:22  
But now that makes sense.

9:24  
OK, fine.

9:25  
Is this always hold true?

9:26  
So for example, what if the other guy decides to post a price of 500?

9:32  
You're going to be like, fantastic, right?

9:33  
Look at this high price.

9:34  
If I post 44199.99, I'm going to get so much money for every unit that I sell.

9:41  
But guess what?

9:41  
You're not going to be selling very much.

9:43  
Look at your demand curve.

9:44  
You're going to be selling nothing if you post a price of 500, right?

9:48  
So what do you do in that?

9:50  
What you're trying to do is, again, balance the price effect in the quantity effect.

9:53  
Sure, you get this huge swing in quantity, but how many extra are you going to get if you post 499 point $0.99?

10:00  
What do you want to keep track of?

10:02  
Is the monopoly price OK?

10:06  
Monopoly price.

10:07  
This is the profit maximizing price.

10:11  
If you're going to be able to choose any price, if there was nobody else there, you would never stop at 500, right, 499, you'd go all the way down to monopoly because that's the best option for you.

10:23  
OK, so this incentive to undercut has limits in that if that person posts the price, that's the the higher than the monopoly price.

10:34  
Your best response is to just post the monopoly price, right?

10:38  
Because dropping the price, Dropping the price gets you extra consumers, Gets you extra consumers increases profits, the maximum possible, which is the monopoly price.

10:47  
Now if he posts a monopoly price lower, but as long as it's higher than 20, then this incentive to undercut becomes more in here.

10:54  
So this region is where you have this incentive to undercut.

10:58  
OK, so the punch line is the following for Bertrand competition.

11:01  
OK, one is you want to make sure you're making at least zero profits.

11:04  
So if the other guy's posting too low a price, you want to stay out by at least posting your marginal cost.

11:10  
OK, #2 the other guy.

11:13  
If you post too high a price, your incentive to undercut is there.

11:18  
But it's better for you to go all the way down to the monopoly price.

11:21  
It's that range between monopoly and perfect competition that that incentive to undercut really starts to take, you know, to have a huge kind of power, because that's when you're thinking about the quantity effect.

11:32  
That's when you want to keep prices as high as possible because the monopoly is the best case scenario.

11:35  
You don't want to drop prices too much, but you want to get those additional consumers.

11:39  
You want to get that quantity effect in there, OK.

11:43  
So when firms choose quantities at the same time, we are going to be in corner competition.

11:50  
And there we're going to get this, oh, we're going to not be a monopoly, but we're not going to go all the way to perfect competition.

11:56  
When firms choose prices at the same time, which is Bertrand competition, this incentive to undercut is huge.

12:04  
So if you're going to post a price of $60.00, I want to post a price of 5999.

12:08  
If I'm going to post a price of 5999, you want to post a price of 5998.

12:13  
Want to undercut, We want to undercut.

12:14  
We're best responding.

12:15  
This competition forces are huge because of this price effect is small, but the quantity effect is is gigantic.

12:22  
That's going to lead us to this mutual best response.

12:24  
We're going to go, you do this, I do this, we want to keep changing.

12:26  
We're going to keep changing.

12:27  
We're going to end up at a point when neither of us wants to change.

12:31  
The only point where neither of us wants to change is when we're posting our marginal cost price.

12:38  
OK, anything higher than marginal cost, I want to change.

12:42  
I want to undercut you right?

12:44  
Too high.

12:45  
I want to undercut you all the way down to monopoly.

12:46  
But that incentive to undercut is there.

12:48  
As long as it's above marginal cost.

12:49  
Anything below marginal cost, I don't want to stay there.

12:52  
I want to go back up, right.

12:53  
I don't want to match you.

12:55  
It's exactly at marginal cost pricing where there's no incentive.

12:58  
You're posting 20.

12:59  
I don't want to do above, I don't want to do below.

13:01  
I want to stay at 20.

13:02  
If I'm posting 20, you want to stay at 20.

13:04  
That's when this incentive to undercut stops.

13:07  
OK, so the equilibrium outcome with just two forms, you don't even need more than two forms, right?

13:15  
You start off with like, oh, let's do monopoly.

13:16  
And then you kind of following this incentive to undercut and you stop all the way back at price equals marginal cost, which is the same outcome as perfect competition, right?

13:25  
We just need 2 firms in order to reach efficiency, which kind of sounds a little bit unrealistic, right?

13:32  
You're like, OK, so firms are competing, there's only two firms in the market and now we're ending up back in perfect competition where everyone's making zero profits.

13:40  
Is this kind of realistic?

13:43  
And the answer is not really right?

13:44  
Because remember, Bertrand competition assumes no capacity constraints, which is a huge assumption, all right, and maybe true at some point, but it's not always going to be true in most industries.

13:57  
So at some point you're going to have capacity constraints.

13:59  
And then we're kind of switched towards corner competition.

14:01  
So the examples about in competition are kind of very limited #1, #2.

14:07  
This huge swing or is relies very heavily on this assumption that consumers treat these goods as identical and there's no transaction cost.

14:17  
If you can think about the classic example of goods that are truly actually identical, you know, it's Coke and Pepsi, right?

14:24  
There's a very few limited number of, you know, sodas out there.

14:27  
Let's pick suppose there's only Coke and Pepsi blind taste test.

14:30  
These things are pretty much identical, right?

14:33  
But still in the minds of consumers, they're different.

14:36  
That's what we call product differentiation.

14:38  
Product differentiation in the minds of consumers makes identical goods different and that dampens the switching.

14:45  
Sure, if Coke drops its price by 1 cent, some consumers will switch, but not all of these consumers.

14:51  
And anytime we have a dampening of this quantity effect, we don't have to go all the way back down to margin cost pricing.

14:58  
That's one of the reasons why you see soda companies spending so much money on advertising because in their head they're trying to create product differentiation in the minds of consumers.

15:09  
OK.

15:10  
So in Bertrand competition with just two firms, OK, because of whistle keeping all of those other assumptions of perfect competition which is you know identical goods and no transaction costs.

15:24  
We're going to get these huge swings in the number of consumers is going to lead to this huge incentive to undercut by 1 cent gives you half of the market that incentive to undercut the very strong drive for competition is going to lead us all the way back to perfect competition, right.

15:42  
We're going to end up with marginal cost pricing and the efficient outcome.

15:46  
I really want you to focus on the mechanism.

15:49  
A lot of students will assume that Bertrand relies on results in marginal cost pricing.

15:56  
But I really want you to think through the mechanism.

15:58  
If you're understanding the mechanism, then you go to a job where there's some product differentiation, you understand how to work with that and not just assume it has to be marginal cost pricing and say, tell your phone there's no hope, OK?

16:11  
In the second year and beyond, when we introduce more complications, you'll be able to handle that because you're focusing on the mechanism.

16:17  
You can even within the one-on-one context, think about small changes like what if these two forms are not identical, one has a lower cost than the other.

16:25  
What's going to be the result?

16:26  
If you're thinking about the mechanism and the incentive to undercut, you're going to be able to work through those examples.