**W9 V1 Marginal Revenue**

0:09  
In this video, we're going to be talking about a monopolist's marginal revenue, the relationship between demand, marginal revenue, and how revenue changes when prices change.

0:20  
There can be different reasons for why we see a monopoly in the market.

0:24  
I'm gonna phrase it as there's some resource cuz we started off by talking about resources, so let's continue with that.

0:30  
There's some resource.

0:30  
All resources are scarce in our view.

0:33  
But there's something in this market that allows a firm to control a scarce resource, effectively making it the only producer in that market.

0:42  
This could be because it controls all the natural resources required for that industry.

0:47  
It could be something as simple as technology.

0:49  
They're the most productive at producing this, so they're the only firm.

0:52  
It could be because they have ownership of a scarce resource, like a patent, which allows them to be the only producer in that good, OK, something that's becoming very important when we think about social media, this idea of network effects, right?

1:05  
The firm with the most users is the one that survives in that becomes a monopolist.

1:10  
I'm not going to talk too much about this because the textbook does a really good job of explaining all of these, so I'm going to leave that for the textbook.

1:16  
We'll focus on a market given a monopoly.

1:20  
However, there is one reason for a monopoly that we will focus on this idea for natural monopoly when it is actually efficient to have one phone be the only producer because that minimum efficient scale that we talked about earlier is so large relative to the size of the market.

1:38  
So we'll define that and talk about that a little bit later.

1:41  
OK.

1:42  
Now I'm going to phrase everything is market power because this allows us to make a link between this week and next week when we're going to be talking about more general forms of price discrimination and the following week, which is oligopoly.

1:54  
OK.

1:54  
So I'm going to say there's something about a market and some reason for which a firm has market power.

2:01  
So what do I mean when I say market power?

2:03  
What I mean by that is when a firm chooses to raise its prices, right?

2:08  
And now we're entering the territory where firms have choices over prices.

2:12  
So far that wasn't the case.

2:14  
When a firm raises its prices, what happens to the demand for its good, OK.

2:20  
This is going to obviously depend on the number of close competitors, right.

2:23  
So we've seen how dramatic that was when we had perfect competition.

2:27  
So we effectively made it a price taker and it also depends on the types of goods we're looking at, right?

2:32  
Some goods allow for more market power than others, and we'll discuss this with more examples as we move on, OK.

2:40  
So, so far we've been looking at perfect competition where each firm was so small relative to the market that if it chose a price even a teeny tiny bit above the current market price, it lost all of its consumers, right?

2:51  
It basically had zero market power because it lost everybody.

2:56  
Right now we're gonna go to the other extreme where we have a monopolist, there's no close competitor.

3:01  
So if a firm raises its prices, it's going to lose a few competitors.

3:06  
That's because of the marginal willingness to pay versus price calculations that people are doing, right.

3:15  
You raise your price, you lose a few people, they're not buying the good anymore, but they're not going to competitors in that.

3:22  
There is no close competitors within that same market who provide the same product, OK.

3:28  
So we've gone from perfect competition with 0 market power to a monopolist where the firm has all the market power and oligopoly will kind of be a little bit in between.

3:39  
We can see that reflected again in the demand for a firms products, right.

3:44  
So perfectly competitive firm.

3:45  
We said you price a teeny tiny bit above, you're getting nothing, you price a teeny tiny bit below, you get everything.

3:52  
So effectively, the demand for your product is perfectly elastic at the market price for the monopolist, you pick a price, you raise the price a little bit, you lose consumers because of their marginal willingness to pay versus price calculation.

4:06  
They're not going to other competitors.

4:08  
They're just not buying the good anymore.

4:10  
They're switching to other products in other markets potentially, right.

4:13  
And similarly here, you drop it and you lose, you gain some consumers, but that's because these are new consumers or people choosing to buy more.

4:21  
So the demand for a monopolist products will be market demand, OK.

4:29  
And that's what we mean when we look at these extreme forms of market power.

4:34  
Now when we're saying you can choose it for us, we can frame it as a monopolist choosing price or quantity depending on where you've studied before and if you've studied economics before, you may choose something versus the other.

4:47  
Notice it's the same thing.

4:48  
You choose price, you're going to get quantity, you're going to choose quantity.

4:52  
You'll get price through the demand curve.

4:55  
I'm going to focus everything we do on choosing quantity because extra unit, extra unit, extra cost, extra benefit.

5:02  
We've done this before.

5:03  
It's familiar for us.

5:03  
We can bring everything from the previous modules in and make our lives a little bit easier.

5:08  
So that's why when I'm going to do any choice of monopolies, I'm always going to start with quantity and then back off the price from them.

5:16  
In this module, we are looking only at what we call single price monopolist.

5:21  
We will relax this next week.

5:22  
But for this week we are saying that if a monopolist chooses to post a price, it has to sell all the units at that same price, OK?

5:31  
It can't offer discounts.

5:32  
It can't offer different prices for different people.

5:35  
Whatever price it posts, everybody pays that price.

5:37  
OK.

5:38  
The jargony term we're going to look, we're going to call this is a single price monopolist to pay attention to that.

5:44  
Initially we're kind of emphasize that a lot, but as we go further, we'll drop that.

5:48  
But you're always scanning for that assumption.

5:51  
That's the important assumption for you.

5:54  
OK.

5:55  
So now we go back to basic principles.

5:56  
Principle one, all costs are opportunity costs.

5:58  
We're going to keep that in here.

6:00  
Principle two says, if I produce, how much do I want to produce.

6:04  
We have so far spent all our time on the marginal cost because we were working in perfectly competitive firms and for them they were price takers.

6:13  
So marginal revenue was very straightforward.

6:15  
So we built up the whole cost side in the cost module.

6:19  
Now we're going to take that as given because we know you know how to work with costs and we're going to dig a little bit deeper into what this marginal revenue is as we move away from perfect competition, right.

6:29  
So as I sell an extra unit, how much revenue do I get?

6:34  
Extra revenue, Do I get, OK, that's what we're going to be talking about as marginal revenue.

6:40  
And that's going to fit very neatly into our framework of marginal benefit, marginal cost in order to determine the quantity.

6:46  
OK, So what is marginal revenue for a monopolist?

6:50  
When we do oligopoly, we're going to phrase it the same way.

6:53  
When we talk about price discrimination, it's all about marginal revenue, which is not so simple anymore because of principle two.

7:01  
OK.

7:02  
Now again we're going to do discrete data, continuous data with everything that we've done because we need you to be comfortable using both Marginal revenue calculations are going to be slightly different whether you're using discrete data or continuous data and that's just because you know of approximation.

7:18  
So we'll point that out and we'll show you kind of be careful about that.

7:21  
This is especially problematic if you're going to be doing multiple choice questions and you've not paid attention to this, or if you've gotten to habit of converting data from one form into another because you find it more easier to work with.

7:35  
OK, be careful.

7:36  
Please do not do that.

7:37  
You should not have been doing it.

7:38  
And do not do it, especially here.

7:41  
OK, so here's the thought process that a monopolist is thinking.

7:45  
We think of monopolists that these really big bad guys who want to charge the highest price they can.

7:49  
Sure, but monopolists are also constrained.

7:52  
OK, Now they want to sell more units because every extra unit brings them more money.

7:58  
So that's a good thing, right?

7:59  
So monopolist really wants to sell a lot.

8:01  
On the other hand, if it has to sell the extra unit, right?

8:06  
People were not buying it before, Why were they not buying it before?

8:09  
They were not buying it before.

8:10  
Because people make decisions based on marginal willingness to pay versus price.

8:15  
So if you want them to buy the extra unit and they didn't buy it before, then you're going to have to lower the price for that last unit.

8:23  
The problem with the single price monopolist is that they've got to lower the price on all of the units and that kind of lowers their revenue, right.

8:31  
So this tension between what we call the quantity effect and the price effect is what's going to, in a certain sense, constrain the monopolist and lead to important insights into how monopolist choose their quantities and hence price.

8:46  
OK, but the total effect for us for marginal revenue will be the sum of the price effect and the quantity effect.

8:53  
Keep that in mind, especially when we're doing calculations.

8:58  
OK.

8:58  
Now the implication for the diagram, which I'm going to show you in a second, is going to be that the marginal revenue will be less than the price.

9:06  
And so far, the marginal revenue has been equal to the price, and here's going to be less.

9:10  
So let's think a little bit more about how we can use the price effect and quantity effect to understand why.

9:17  
When I sell an extra unit, what I get an extra revenue is actually less than the price I sell that unit for.

9:25  
OK.

9:25  
So to compare it, let's think about a perfectly competitive firm.

9:29  
In a perfectly competitive firm, if I'm selling, you know, let's say 10 units and I want to sell the extra unit, the good thing about being a perfectly competitive firm is that I have no effect on the market, OK.

9:41  
So if I sell that extra unit, I just get the market price, right?

9:46  
That's it.

9:46  
I don't get anything less, I don't get anything more.

9:48  
I get exactly the market price by selling that extra unit, the quantity effect.

9:52  
Now I sold all the previous units for the market price.

9:56  
I'm going to sell this extra unit for the market price.

9:58  
So I don't lose anything in the on the previous units, which means that my marginal revenue here is just market price.

10:08  
We've been talking about this, but we've never really broken it up.

10:11  
But here you can kind of see that marginal revenue equals price for a perfectly competitive firm because they don't affect the market price by selling an extra unit.

10:21  
Now that's not true for a monopolist.

10:23  
OK.

10:23  
So suppose the monopolist was selling 10 units, then this was the price that it sold it for.

10:31  
OK.

10:31  
So now it wants to sell an extra unit and that's great because it wants to sell the extra unit.

10:37  
But as we've discussed before, it has to lower the price for that unit.

10:41  
So it's going to have to lower the price on that extra unit.

10:45  
So it's going to get one extra unit and it's going to sell it for a lower price P2.

10:53  
So this is going to be the price of the quantity effect with this lower price for that extra unit.

11:01  
OK.

11:02  
Now the problem is that it doesn't have to sell just the 11th unit for P2.

11:06  
It's got to sell all the previous 10 units, which it was getting this really high price for, OK.

11:12  
It's going to have to sell that for a lower price is losing this amount of money on all of the previous 10 units, right?

11:23  
And that is what we call the price effect, which is negative, right.

11:27  
It's reducing my revenue.

11:29  
That is why marginal revenue here is going to be the sum of these two things.

11:36  
It's going to be the good part, which is that, but the quantity effect, but I'm going to be losing the price effect because of the single price assumption.

11:49  
All of those 10 units have to be sold for PE2 just because I'm selling the 11th unit for P2 as well, OK.

11:58  
This is why marginal revenue that I get is going to be lower than the price.

12:03  
And I'm going to represent that by marginal revenue looking something like that, right?

12:08  
It's going to lie below the demand curve.

12:10  
The demand curve tells me the price.

12:11  
I can get P2 for this good, but what I actually get in terms of extra revenue will be lower than that because I've got to lower the price on my previous units.

12:22  
Let's look at this with integer values.

12:24  
So typically here at this point you're given a demand curve with discrete data and so you've got price data and quantity data and you're asked for the marginal revenue when price goes from when quantity goes from 20 to 21.

12:38  
Notice I'm thinking about marginal revenue, it's always extra unit, extra units.

12:43  
Extra unit is extra quantity going from 20 to 21.

12:48  
Now what is the marginal revenue?

12:51  
Marginal revenue is just the change in revenue.

12:55  
OK.

12:56  
So it was the revenue I got from selling 21 units minus the revenue I got from selling 20 units, right?

13:05  
So you're just going to 1st calculate the revenue you get at every point, which is there.

13:10  
And then the marginal revenue will just be the change in the revenue.

13:15  
So going from 1200 to 12118, I know that my marginal revenue here will be 18.

13:22  
Similarly, you can calculate all of this information based on this data.

13:26  
So that's a pretty straightforward calculation in here, OK.

13:29  
Now again, you're going to see marginal revenue is less than the price.

13:33  
You're not convinced before.

13:34  
Here you've got the price here, you've got marginal revenue, you've got a price that's high and you've got a marginal revenue that's less than that.

13:41  
And the question is why?

13:42  
So let's break it up into the price effect and the quantity effect in here.

13:47  
OK, when I go from 20 to 21 units, it's a good thing for me because I can sell this extra unit quantity effect for $58.

14:00  
On the other hand, I used to be selling 20 units at a price of 60 right up here, but now on each one of those units that I'm selling, I'm losing $2.00 because I now have to price them at 658 right?

14:22  
So I'm effectively by lowering the price to sell that 21st unit, losing $40.00.

14:30  
So the marginal revenue here will be the quantity effect plus the price effect, but because the price effect is negative, giving me a net change of $18.00 which is what I have here.

14:42  
OK, now this is this create data.

14:46  
I have a big jump, one unit 20 to 21.

14:50  
OK, and that's how I can really nicely see this price of it.

14:53  
Quantity effect.

14:53  
One unit 1 unit works really well.

14:55  
For intuition, sometimes we have continuous data and then we want this same kind of calculation.

15:03  
It's going to be different now because I have more data, right?

15:05  
I don't just have 20 to 21, I don't have to take this big jump from 20 to 21 to calculate the marginal revenue.

15:12  
I can calculate the marginal revenue for a teeny tiny extra bit.

15:16  
When we have to calculate teeny tiny extra changes, we use calculus.

15:19  
I'm going to show you a little calculus.

15:21  
If you're comfortable with it, you'll understand what we're doing.

15:23  
If you don't know calculus just yet, that's fine.

15:27  
You just have to remember what the punch line is and you can work with that.

15:30  
OK, so now if you do know calculation, what is revenue?

15:34  
Revenue is price times quantity, right?

15:36  
So the first thing you want to do is you want to make sure you are using price, but as a function of quantity.

15:43  
The reason for that is because marginal revenue is always extra quantity.

15:46  
So I want to take the derivative with respect to quantity, right?

15:49  
So revenue here is going to be price times quantity.

15:53  
I want to make sure price is a function of quantity.

15:56  
And then I plug that in to my equation.

16:01  
Multiply this by Q.

16:04  
That's what I've got here.

16:06  
When I open it out, this is going to be my equation.

16:08  
Now what I want is how this revenue changes when I change Q.

16:15  
So I'm going to take the derivative of this revenue with respect to Q and I'm going to get A + -, 2 B times Q.

16:25  
So if you compare this to your initial starting demand curve, here you've got B, here you've got 2B.

16:34  
So marginal revenue.

16:37  
If I have a linear demand curve, especially if you've done calculus, you're going to remember that this only holds 2 for a linear curve.

16:44  
Marginal revenue is going to be twice the slope of the demand curve, making sure you have first converted your demand curve into price as a function of quantity.

16:54  
If you don't do that, you're going to get the wrong thing.

16:55  
OK?

16:56  
For those of you don't have no calculus, that's fine.

16:58  
Just remember this punch line over here.

17:01  
But also, you need to remember to 1st convert into price as a function of quantity.

17:06  
OK, so firm demand, marginal revenue for a perfectly competitive firm lies exactly over firm demand.

17:14  
Market demand is still market demand.

17:16  
Firm demand is the same as price for a monopolist.

17:19  
It's going to be twice the slope of the demand curve.

17:22  
Visually, that's what it's going to do.

17:23  
It's going to lie below and it's going to be twice the slope of the demand curve.

17:29  
So here's what we've done.

17:29  
We've talked about what market power means and we've shown you that monopolist have extreme market power, right.

17:35  
So therefore their demand curve for the firm is also the market demand curve and the single price assumption, the fact that they have to charge the same price for all units means that because of a price effect here, which we didn't have before, marginal revenue is going to be less than the demand curve.

17:52  
It's going to lie below the demand curve.