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JONATHAN GRUBER: OK. So today we're going to continue our discussion of oligopoly. You remember last time we started by saying, look, fundamentally, when you have multiple firms in a market, there's two ways they can behave. They can cooperate or not cooperate. And we talked about what happens when firms don't cooperate and basically how it leads to a worse outcome for everybody involved because the dominant strategy basically is the prisoner's dilemma.

So obviously firms can do better if they go into the market and instead of competing, they form a cartel. And the way to form a cartel is quite simple in theory. The firms would get together. They would say, we are going to act as if we're a monopoly. We're going to treat ourselves as one firm. And at the end of the day, we'll just split the money.

So we'll basically treat ourselves as a monopoly for decision making, and we'll split the money at the end. So for example, remember from last time we had a demand curve of the form p equals 339 minus Q and your marginal cost of $147. And we solve this monopoly problem last time-- remember, when American was the only firm in the market, the monopoly solution was q equals 0.96, p equals $243. That was the monopoly solution.

So with the cartel case, what firms will do is they each say, look, we want 96 flights total. Let's just each do 48 flights and let's split the profits. So what does each firm get? Well, profits-- what are profits? Profits are price minus average cost times quantity. Well, price is $243. In this example, Average. Cost equals marginal cost for the relevant range. So that's $147 times 96 flights. Total market profits are 9216. Or alternatively, each firm gets $4,608.

So when they cartelize, that's the profits they make-- price minus average cost times quantity. In our example, average cost equals marginal cost. So price minus marginal cost times quantity gets you 9216 in total profits, or 4608 per firm. Compare that to the profits each firm makes in the Cornell equilibrium. In the Cornell equilibrium, as we solved last time, under Cornell, as we solved last time, we found that the price was-- they charged $211.

Minus 147 was their profits per unit. And they each did 64 flights, so their profits for each firm were $4,096. So profits 12.5% higher if they cartelize. Because they keep the price higher, they make more profits per unit. So if they cartelize, each firm's profits is $4,608 rather than $4,096 So cooperative equilibria deliver a better outcome than competitive, than non-cooperative equilibria in an oligopolistic market-- generally true.

Once again, in 14.12 you'll learn the fun examples where that's not true, but generally true. For this course, it's true. Now that raises the question, why don't all oligopolistic markets feature cartels? And there's really two reasons. There's one that economists focus on and one that lawyers focus on. The one that economists focus on is the incentive-based explanation, which is that cartels are fundamentally unstable.

They're unstable in the same way that the prisoner's dilemma creates instability, which is the prisoner's dilemma, I can only solve it if I really, truly trust you. If I'm afraid you're going to rat on me, then I'll rat on you. It's the same in the cartel. There's an incentive to cheat. And that's because when you cheat-- I'll show you mathematically-- when you cheat, you get all the benefit, but only bear half the cost.

What do I mean by that? Well, let's show you what I mean by that. Imagine that American-- quietly, without telling you-- they've agreed to this equilibrium. They're each going to fly 48 flights, and they're each going to make $4,608. Now, American without telling United, says, I'm going to do 50 flights. I'm going to up my number of flights to 50.

Well, the only way American can do that, given the downward-sloping demand curve, is by the price coming down. So if American does 50 flights, that raises the total to 98. So if American cheats and does 50 flights, then the price goes to-- then the quantity goes to 98. So price falls from $243 to $241. The price has to fall if you're going to sell 98 flights instead of 96 flights.

What does American make in profits? Well, the profits for American are $241 minus $147 times 50 because they're doing 50 flights now. That's their new profits. And so the price is falling, but they're flying 50 flights. And so they get new profits of $4,700. Their profits have gone up by cheating.

Well, what's United's profits? Well, I think you know the answer. United's profits have gone down. What's the profits of United? Well, there, it's $241 minus 147, but they're still only doing 48 flights. So their profits fall to $4,512. Sorry, this has gotten compressed. So price is $241. Cost is $147. They're still doing 48 flights. $241 minus $147 times 48 is $4,512.

So by cheating, American has raised their profits, but lowered the profits of United. And if you do the math, United's profits have fallen by as much as American's have gone up. But the total profits in the market have shrunk. Look at the total profits in the market now. Total profits in the market are now $9,212 instead of $9,216. You do $4,512 plus $4,700, you get $9,212.

Total profits have fallen in the market. Why? Because they didn't do the optimal monopoly solution. But they fall in a way that makes American better off and United worse off. What's going on? What's going on is a version of the poisoning effect. Remember, the reason when there are monopolists, they wouldn't raise the quantity to 98 is the poisoning effect.

But when American raises its quantity, it gets all the benefit of a higher quantity, but spreads the poisoning effect with United. And American gets all the benefit of going to 50 flights. But the poisoning effect gets shared with United-- the lower price. So American has incentive to cheat because by cheating you get all the benefits, only pay half the costs.

And that's why cartels are unstable. Because basically, cartels feature a version of what we call the public goods problem, which is whenever my action delivers benefits not only to me, but to you, then I might not behave in the flavor that was best for both of us. And we'll come back to that later in the semester.

But since my action, by limiting my quantity-- if I'm American, by limiting to 48, I benefit not only me, but you. So therefore, by cheating and going to 50, I benefit me and we share the costs. And therefore, it's a better thing to do. So our cartel is fundamentally unstable because any actor in the cartel can make more money by deviating. Does that make sense?

Now, the lawyers would say, well, you economists and your stupid math. You can't even write on the board. It's all squished. Let's just come to a second reason why we don't like cartels, we don't have cartels, which is, they're illegal. Cartels are illegal. So basically, in the late 1800s, cartels were common. This is the way much of major industry organized itself.

From oil to railroad industries, this is called the era of the robber barons, or the Gilded Age. There were giant families like the Rockefellers and the Vanderbilts that basically cartelized giant industries like oil and railroad. Now, how did they enforce this? How do they enforce this? Well, the lawyers for Standard Oil-- I forget which family that is, if that's Rockefellers or Vanderbilts. I forget which one. I think it's Rockefellers.

Lawyers for Standard Oil said, basically, we're going to create what we're going to call a trust. And the way this trust is going to work is all firms in the industry will agree to turn over their pricing and production decisions to a common board or trust. And that common trust will make the industry-wide pricing and quantity decisions. And then we'll split it.

So basically-- now, you still could cheat. But they tried to set up a non-cheating mechanism by having this sort of objective mechanism that was outside them that got to decide and then monitored how much oil they sold and what price they got. Now this was in the open. This wasn't secret. They said, we're forming this trust. And that led to a big backlash and the creation of what you might have heard of as the antitrust movement and the development of antitrust law.

Antitrust law is basically anti-cartel rules and regulations-- rules and regulations to try to break down cartels. Now lawyers would say, we have these, so who cares about the economic incentives? Well, the answer is the reason economists care about economic incentives more than laws-- or at least as much as laws-- is because the laws don't always work. So let me give you a couple of examples.

One example is the Hollywood movie industry. So basically, the Hollywood movie industry has long been dominated by few big firms. The firms have changed a little bit over time, but it's MGM, Fox, Warner. And these films produce firms-- these firms produce films and sell them to movie theaters. And movie theaters then show a variety of movies-- the megaplex, all the movies they're showing.

In the 1930s and '40s, these firms started buying up the movie theaters. And when they'd buy the movie theaters, they'd say, this is now a Warner movie theater. It can only show Warner movies. So it essentially created this anti-competitive practice where it would not let movie theaters bid against each other for movies.

They would just say, look, if you're a Warner movie theater, you only show Warner movies. And therefore, MGM movies couldn't compete in certain markets. So let's say you're the one movie theater in town, you're a Warner movie theater. You can charge whatever you want because there's no MGM movie to compete with it. If you want to see an MGM movie, you've got to go to the next town.

So this is exactly the kind of anti-competitive practice that antitrust laws are designed to break up, and they did. But sometimes it's harder, because they're less out in the open. So let's take the case of airlines. In the early 2000s, oil prices went up. And Airlines started adding oil surcharges. So rather than just raising their prices, your ticket for the airline would say, here's your price, and here's your oil surcharge because oil prices have gone up.

In 2004, British Airways and Virgin Atlantic were the two dominant airlines flying across the Atlantic. And they met in secret and reached a deal. And their deal was that they would, in a coordinated way, jack up the oil charges. And the oil charge went from $10 to $120 a ticket. And they agreed they wouldn't undercut the other persons. Because they weren't really oil charges at that point. They were just higher prices. It was just an excuse that oil prices had gone up.

And they basically said, look, we won't undercut each other. We'll have a cartel. The cartel, instead of coordinating on the explicit price of the ticket, will coordinate on this bonus part of the price. That's what the economists often call it a shrouded attribute, an extra part of the price you don't pay attention to. Consumers won't notice as much because they're less price elastic to these hidden parts of costs. And we won't undercut each other. We'll make a lot of money.

So basically they got this deal that worked. But here's, once again, why economists think incentives matter. The lawyers for Virgin Airline caught wind of what their executives had agreed to. And the lawyer said you know what? If British Airways ever says, ever tells what we're doing to the regulators, British Airways will get away with it and we'll be screwed.

So what did they do? They went to the regulators. Because it's a repeated game with an end. They knew that at some point, someone was going to cheat. Someone's going to break it up, it might as well be them. They did. They went to the regulators, reported the scheme, got a slap on the wrist, and British Airways got an enormous fine. Virgin Airways paid nothing. British Airways paid $500 million.

So this instability is not just mathematical. It's just generally a feature of why cooperation is hard. Cooperation requires trust and consistency. And that's hard between natural competitors. It's hard to make that happen. So that's-- cartel instability, the laws help. But here was some way they were getting around the law.

What broke it up was not the law. What broke it up was incentives. So economists trust incentives over the law. Now there's a third example, which is quite interesting, which is, sometimes cartels can operate in the open and get away with it. Let's talk about the National Football League, the NFL.

The NFL is the most important football organization in America, the most profitable and important football organization in America. Football is the most profitable sport in the country. Advertising is incredibly valuable during football games, increasingly so because now we all watch. It's the one place in the world you don't stream. So we stream everything we watch now, so we don't have ads.

You can't stream sports. So sports advertising has gone through the roof because advertising in other contexts is less valuable. It used to be you could advertise everywhere. Now you can't. It's really just sports is the last place people watch ads. So it's incredibly valuable.

Now the NFL is 32 teams-- essentially 32 businesses competing, in a literal sense, with each other. And there's a huge incentive to collude. Let's take the New York Giants and the New York Jets-- the New Jersey Giants, New York Jets, but it's the same market. Let's say the major TV station says, look, we're going to broadcast whichever team gives us the better deal.

Well, the Giants and Jets will have to compete with each other to give the TV station a better deal. But let's say they say, look, we'll agree not to do that. We'll just tell the TV station, this is our price. Basically, instead of $1 billion, it'll be $2 billion. We each have $2 billion. You either take it or leave it. And the TV station ends up broadcasting both. Or maybe one TV station takes one, another TV station takes another.

And more generally, what the NFL does is they only sell the TV rights for the League. They don't sell TV rights for individual teams. So individual teams do not sell their TV rights, which could lead to competition. The League just sells the TV rights, which causes a cartel. Essentially, they're saying, if you want to broadcast football, you got to come to us. And we're going to charge a super high price.

As a result, quite frankly, watching football is a bit of a pain in the ass at this point. So you've got network TV, which if the local team is on, you can only watch the local team. Otherwise, there may be one other game on. You've got Sunday Night Football, which is on network TV. You've got Thursday Night Football, which I think is on Amazon or ESPN-- Amazon, Thursday night? Who's got Thursday Night football?

AUDIENCE: Amazon.

JONATHAN GRUBER: Amazon. You've got Sunday Morning Football from London, which is ESPN+. Then you can do what I did and pony up $350 to buy Sunday Ticket if you like an out-of-town team, you want to watch your team, which lets you watch any game you want on Sunday, except the Sunday morning games where you still have to buy ESPN+, as I learned, much to my chagrin.

So it's incredibly expensive to watch football! If you want to see all of football games, it costs you a pretty penny. Why? Because the League has colluded and set up a structure where basically, firms can't undercut each other. Otherwise, firms would say, look, a lot of people want to watch my team, I'm going to go strike a separate deal.

Indeed, in 1957, The Supreme Court-- 1957, even before I was born. That's how long ago it was. The Supreme Court ruled that this was anti-competitive, and they couldn't do it. They did, yet it's still done. And the NFL will make $40 billion this year off their collusive cartel. Why? Because Congress stepped in and said, well, we're going to grant them an antitrust exemption.

We're going to say, football is such of a national important priority that we're going to actually exempt football from our nation's antitrust laws. So I said last time in my previous lecture, I'd prove to you that Congress cares more about football than economics. They cared more about the Football League than actually making football affordable for us to watch.

So by granting them an antitrust exemption, they allowed them to collude and have this one league that makes it incredibly expensive to watch football. OK? Questions about that. One other fun example. We're going to discuss international trade in a few lectures. It's a really interesting topic. We'll spend some time on it. But the bottom line is, economists generally feel free international trade is a good thing.

We'll come back to subtleties, but roughly speaking, we believe free international trade is a good thing. And for years, that was reflected in the views of the Republican Party. The Republican Party was a party of free trade. Democrats were the party of less free trade. That's changed over time. But that was the tradition. When I was a kid, there was the free trade party and the less free trade party.

Ronald Reagan-- you don't get more Republican than Ronald Reagan. Ronald Reagan in 1981 faced a problem, which is, Japan was starting to make cars that Americans liked more than American-made cars. And Japan was killing us in the car market. Americans were buying Japanese cars instead of American cars, and the US manufacturers were mad.

They said, you should limit how many Japanese cars come in. And Reagan said, I'm a free trade Republican. I can't do that-- or at least, I can't appear to be doing that. So what did they do? They said, I'll tell you what. We're going to negotiate a deal. We're going to call a voluntary export restraint-- a VER. We're going to say to Japan, look, you can do what you want, OK?

But we're going to ask you to limit how many cars you sell in America. Let's say you're selling 2 million cars a year. We're going to ask you to limit to 1.5 million a year. We're not telling you. I'm free trade. We're just asking you. Why did Japan agree? Why did Japanese automakers agree to reduce how many cars they sell in America? I mean, it's not geopolitics. It's economics. Yeah.

AUDIENCE: Because it's better than the alternative of getting their--

JONATHAN GRUBER: Yeah, it's essentially the US cartelized the Japanese industry. We basically said, we won't let you compete your price down. Remember I talked about government can fix monopoly by regulating a low price? This is government regulating a high price, regulating a low quantity. So basically, Japan said, sure. We, the companies, would love to compete less. We just can't do it.

So you are basically enforcing cartelization on us. You're enforcing the fact we can't drive the price down of our cars. Thank you very much. The estimates are that as a result of this deal, the average Japanese car price in the US rose by 14% And US consumers, the best estimates are, lost $3 billion in consumer surplus from the fact that they couldn't buy cheap Japanese cars they wanted.

So these are all examples of different ways cartelization can happen. It's hard. Governments can play both a constructive and destructive role. OK? Questions about any of that. OK. So what I want to do now is I want to do a little comparison between the models. Let's compare the models. We've now covered three models. We've covered perfect competition, monopoly, and oligopoly-- at least in the Cournot case.

And once again-- I've said this a million times, I'm sorry to bore you-- but the Cournot case is the very tip of the iceberg. There's a million other interesting cases you can learn about in 1412. Let's look at what each of these three cases imply. So we have monopoly. We have perfect competition-- I'm sorry, we have oligopoly, by which we mean Cournot. And then we have perfect competition.

Let's see what these imply for the quantity produced and what they imply for profits per firm. Well, we know that if they monopolize, the market quantity is 96 and the profits for firm are $4,608. I solved that up above. We know from up here that if they don't monopolize, each firm produces 64. We solved that Cournot problem last time. So the market quantity is 128 and the profits are $4,096, or 12.5% cheaper. I solved that up there.

What about perfect competition? What is the quantity sold in this market in a perfect competition? Everything you need to answer that question is at the very top of the top board. What is the quantity sold in this market in perfect competition? Yeah.

AUDIENCE: 192?

JONATHAN GRUBER: 192. And how did you get that?

AUDIENCE: Price equals [INAUDIBLE]

JONATHAN GRUBER: Right, price equals marginal cost is the key condition for perfect competition. Good answer. Price equals marginal cost is the foundation of perfect competition. That means the price is $147. That means the quantity, by the demand curve, is 192. Same person. What are profits? Price is $147.

AUDIENCE: 147 times--

JONATHAN GRUBER: Well, price is $147. What's the cost? $147.

AUDIENCE: $0.

JONATHAN GRUBER: $0. Perfect competition leads to $0 profit. So this is a really important table. Because look what you see-- as the market gets more competitive, more units are sold and profits fall. More units are sold and profits fall. And the general feature you get-- generally true-- the oligopoly case will lie between the monopoly and perfectly competitive case. That's generally true.

We can bound the outcome by the monopoly and perfect competitive case. The oligopoly case will be somewhere in between. Questions about this, why this lines up the way it does? What does this mean for welfare? Well, we could go through-- and you were asked through some of this last night-- and calculate the producer consumer surplus for each of these cases.

But you had a long night, I won't make you do that. I'm going to teach you a shortcut now that you'll wish I taught you Monday. The shortcut is remember what causes deadweight loss-- trades that are beneficial to both sides that are not made-- or in other words, deviations from perfect competition. So we know the answer, that this must be the highest welfare outcome.

Because we know from the first fundamental welfare theorem that this maximizes welfare. Guess what? The size of the deadweight loss is proportional to the quantity. In other words, the more you shrink the market from the optimal level, the bigger the deadweight loss, the more trades that don't get made. Because look, the structure of the problem, these first two equations, these are the same.

The structure of the problem has not changed. So as you shrink quantity, all you're doing is creating more and more deadweight loss. Because deadweight loss is about trades that aren't made that would be beneficial. Any trade at a price above $147 is beneficial. Any ticket bought in an airline at a price above $147 is beneficial. Because it wouldn't be bought if the consumer didn't want it, and it's above cost.

So as the quantity falls, as the price rises above $147, the quality falls below $192, welfare is going down. Total social welfare is going down. Producer surplus is going up, but consumer surplus is falling faster. Because deadweight loss is proportional to quantity. The more you restrict quantity from the perfectly competitive case, the bigger the deadweight loss you create.

The more you restrict quantity, for the competitive case, the more trades that aren't made that are beneficial. Questions about that? OK. That's one point I want to make. The second point I want to make is I want to talk about what happens when you have many firms. What happens when you have many firms? Well, we've talked about one firm-- monopoly.

We've talked about essentially infinite firms, which is perfect competition. We've talked about two firms, which is Cournot. What about three, four, five, six, seven, eight firms? What about ends that are between 0 and infinity? Well, it turns out-- and you could sort of see this here-- that the Cournot equilibrium approaches perfect competition as the number of firms goes to infinity.

The oligopoly model approaches the perfectly competitive model as the number of firms goes to infinity. As the number of firms goes towards 1, it approaches the monopoly model. So the oligopoly covers this whole space, depending on the number of firms. And in particular, you can derive this, but you don't have to. The markup that you get in an oligopolistic market is minus 1 over n times epsilon-- the elasticity of demand.

Remember, the market for monopolies was this without the n. You were tested on that last night. That was the markup without oligopoly and monopoly. When you had oligopoly, all you do is add the n to that denominator. All you do is add the n to that denominator. And so basically, the markup falls in an oligopolistic market for two reasons.

One is as the number of firms get large, the markup falls-- and thus the profits fall. The other is the elasticity of demand gets large, just like we talked about in monopoly-- the profits fall, the market falls. So it constrains an oligopolistic in this model is both how many firms they're competing with and how elastic the demand is for the good.

But it's not only that. This is the direct effect of n. There's an indirect effect of more firms, too-- indirect effect. The indirect effect is it's harder to have a cartel the more players there are. So n going up not only lowers profits because through this mechanical mechanism, ending up lowers profits because it breaks possibilities for cooperative equilibria.

So for example, for a long time, the only two countries that sold mercury on the world market were Italy and Spain. Mercury is in lots of stuff. Italy and Spain, and they formed a cartel. And they successfully kept prices up, like OPEC does for oil now. But then other nations, in particular, Russia, started producing mercury and the cartel broke down because they didn't trust those damn Russians and they couldn't form a coalition. And the cartel broke down.

So the other reason n matters is not just mechanical reason, but the logistical reason that cartels get harder the bigger n gets. And then the last thing this raises is, how do we think about government policy in oligopolistic markets. And in particular, a very rich area of government policy is antitrust policy. This is a hugely topical issue.

Some of you may be reading about the Google case that's going on right now, where MIT's own Mike Winston is the key expert witness for the government. My colleague is the key expert for the government in the Google case. What's the Google case? The Google case is that Google has monopolized the market for search engines, which we all know, right? We Google things, we don't Bing them.

So basically, it's easier to say-- I'm going to go Duck, Duck, Go something would just sound weird, right? Googling-- they have the linguistic advantage, as well. And part of the reason they do that that came out in this trial is that they pay Apple $10 billion a year-- $10 billion a year-- to make Google the default search engine on iPhones.

And we're all subject to default bias. We all just go with what the defaults are. I mean, you can always switch your search engine, but no one does. And the key question in this trial is, does Google have 98%, 92% market share because they've paid off the companies to make them default, or because they're better?

Google's just saying, look, we're a better search engine. You wouldn't penalize a company for being better. If we're better, we should get more market share. And that's absolutely true. And that's the incredible difficult part about this case, is the judge has to decide, does Google have 90% market share fairly, by just being a better search engine, or unfairly, by paying off Apple so no other search engines get a chance?

This is an incredibly exciting area of economics. The even bigger case is coming. The Google is just a warm up. Because what's coming next is the-- is it Apple or Amazon? I forget which is the next big one.

AUDIENCE: Amazon.

JONATHAN GRUBER: Amazon's the next big one, right? So Amazon, of course when you go on Amazon-- of course, it's Amazon-- you can buy stuff from Amazon from Amazon Marketplace. So about 40% of stuff that's sold on Amazon is sold on Amazon Marketplace, which is other vendors that come to Amazon and sell on their platform. Because it's great, because you just-- you Google search engine, you Amazon shopping.

When you want to shop, you go. And then therefore, if Amazon doesn't sell it, you find these vendors. Turns out, Amazon charges these vendors enormous amounts. Amazon takes something like a quarter of the profits they make, some huge amount. And they do all sorts of things like making them pay fees. Where they're listed on the list, they have to pay more to be higher in the list, et cetera.

And the government is suing, saying that is antitrust behavior, because we don't have a competitive market for these firms. Since Amazon dominates online search, they have a dominant position to monopolize the ability of firms to sell their goods. Well, what's the counterargument? Well, the government's going to say, look at the data Amazon has-- more than 50% of the entire online shopping market is Amazon. They effectively dominate the market.

Amazon's going to say, we're something like 8% of the entire market for goods in America. Why should you only consider us competing with online things? We also compete with the gap. We compete with brick and mortar, too. Why should you say we dominate, just because we dominate online? These little folks who advertise on us could always just go sell in the gap or sell in brick and mortar, as well.

What's the right answer? That's going to be a hard thing the judge is going to have to decide. But that's why this is an incredibly exciting and interesting area. And it's interesting-- my colleague, Nancy Rose, worked for the government. She was the government's chief economist, doing exactly this for two years, and she's teaching 1420. And she'll teach you all about how this works and the exciting cases and how governments think about this.

But it's a very hard and exciting topic, and obviously very topical. And one thing that this does that's more personal to my research is, think about hospital mergers. So basically if two hospitals want to merge, the benefit is there could be cost efficiencies. So if there's two hospitals across the street from each other and they want to merge, they could be cost efficient. They could share resources. They could shrink the number of beds, maybe, so they don't have so much excess capacity, et cetera.

On the other hand, they get more market power. Unlike these Amazon and Google cases, which are very exciting right now, the typical antitrust case is a little more mundane, which is, when two firms merge, it's a trade-off between efficiencies of merging-- returns to economies of scale-- versus market power. And essentially, what you have to do is evaluate which of those dominates.

So for hospital mergers-- for decades, we let hospital mergers go on. We just said, yeah, whatever hospital wants to merge, we let them merge. We said, look, there's just huge efficiencies of scale. Turns out, we were totally wrong. When hospitals merge, they don't get efficient at all. They just raise prices. They could get more efficient, but they don't. They just raise prices. So now we're starting to crack down on hospital mergers.

But that's exactly, once again, the kind of interesting example we talk about in this field. Let me go to the last topic, which I should have prepped you for more last time because it related to some of the questions I got. I got a lot of questions on roughly of the form, why do firms have to set the same prices? We don't think of firms as competing on quantity. We think of firms competing on price.

You've got this weird model where American and United compete by deciding how many flights to have. That's not how firms compete. They compete by setting their price. And so you were saying that quantity competition is not the right model. Price competition is the right model. So now let's go to analyzing oligopoly in an alternative world where firms don't compete on quantity and let the market decide price. They compete on price and let the market decide quantity.

Here we move from the Cournot model to what's called the Bertrand model. All these French guys got to name the oligopoly models. The Bertrand model is radically different than the Cournot model. Because the Bertrand model has a simple conclusion, which is with price competition, all you need is two firms-- an n of 2-- to get to the perfectly competitive outcome. Why?

If United and American were in truly price competition, why would you only need two firms like that to get to perfect competition? Why is that true if they're competing on price, not quantity? Yeah.

AUDIENCE: Because as long as there are profits, one firm can underprice the other [INAUDIBLE].

JONATHAN GRUBER: It's the same as our entry logic. Remember our entry logic? As long as there are profits, new firms will enter. Well, it's the same logic. As long as there are profits, the other guy will undercut. So if American starts making profits, United will come in a dollar less. They'll still make money. They'll steal the market. So American will become a dollar less.

That'll continue until price equals marginal cost. Now, in fact, it won't, right? Nothing's ever that perfect. But theoretically, as long as price is epsilon above marginal cost, the other firm will come in and set price to half an epsilon above marginal cost and take the market. So basically the Betrand model is totally, radically different. It's just look, two firms is perfect competition.

Basically there's this monopoly of perfect competition. There's no oligopoly. One firm has monopoly. Two firms plus is perfect competition. That is a very radically different prediction, and quite frankly, a lot less interesting. So this raises two points. The first point is, well, what's the right model to use? And the answer, roughly speaking, is it depends on the kind of market you're thinking about.

Basically, price competition is more likely when you can instantaneously meet demand. Quantity competition is more likely when there's lags in meeting demand. Let's think about breakfast cereals versus cars. Breakfast cereals compete on price. Because the truth is, if I'm lower priced, all of a sudden, people want twice as many apple cinnamon cereals, boom-- I make them. They're on the shelves the next day.

Cars-- if suddenly we want twice as many cars, it takes months to produce them. So they can't just undercut price and meet demand. If you undercut in price, you can't meet demand. So they're more likely to compete on quantity. Now in reality, of course, as always, it's a mix of the two. But roughly speaking, the way to think about it is, price competition is more likely in very, very rapid turnaround industries. Quantity competition is more likely in industries with more complicated production processes where there are lags.

And obviously, nothing's at that extreme. But that is the intuition. But it's not a very clean distinction. So you really need to know both models. It's just the Cournot model is more fun. Bertrand model is kind of boring. So that's the first point I want to make. The second point I want to make, which is really interesting, is let's say you are breakfast cereals. You're in the perfect Bertrand competition case-- perfectly competitive, it's easy to create breakfast cereals.

How do you still end up making profits? What do you do if you're a breakfast cereal company in this Bertrand equilibrium to try to make profits? What can you do? Yeah.

AUDIENCE: You can differentiate your product?

JONATHAN GRUBER: Exactly, you can product differentiate. Essentially, you can create little monopolies. You could say, sure, there's perfect competition for Cheerios, but now invented Apple Cinnamon Cheerios. And for a while, at least, I have a monopoly on Apple Cinnamon Cheerios. So now I can go back to making money.

So I'm not choosing cereals at random. It's a great example. So around World War II, there was essentially three types of cereal in World War II-- Cheerios, Cornflakes, and Quaker Oats. That was it. But by 1970, there was more than 150 breakfast cereals to choose from, including ones that are very similar, like Apple Cinnamon Cheerios, by 1970s.

Let me back up. I said this wrong. 1950-- three types of cereals. By 1970, there are 150 cereals. But it wasn't differentiation. It was that stores had realized they could make generic versions. So they made Oaty-O's, which were Cheerios with a different name. But they Cheerios, and then they could sell them at epsilon above marginal cost and make money.

So essentially, the cereal companies were not making profits anymore because generic products had been introduced to essentially mimic what they were making. So they product differentiated. In 1989, General Mills introduced Apple Cinnamon Cheerios. It's less old than you think. It's before you guys, but well after me-- Apple Cinnamon Cheerios.

Now when Apple Cinnamon Cheerios came in, they were delicious-- objectively. And there was no good substitute. So they suddenly faced fairly inelastic demand. So they could raise prices above marginal cost. So General Mills, while getting competed to death on regular Cheerios, could suddenly have a highly profitable Apple Cinnamon Cheerios line. And they patented the apple cinnamon formula.

So for a while, there wasn't competition. Now there's generic apple cinnamon Cheerios, but there weren't for the first few years. So by product differentiating, they ended this death cycle of Bertrand competition. Is that good or bad? Let's come back to welfare. Yeah? Oh, just checking your nails? Question? Answer, rather. Is that good or bad? Yeah.

AUDIENCE: It's good because people are buying new products.

JONATHAN GRUBER: Well, "is it good or bad" depends very much on your model. We think it's probably good because of the principle I've talked about-- revealed preference, which is if people didn't want Apple Cinnamon Cheerios, they wouldn't buy them. So in product differentiating, you've created a new product that consumers want.

Indeed, my colleague, a very famous economist named Jerry Housman, actually estimated that the introduction of Apple Cinnamon Cheerios raised consumer surplus by more than $75 million a year because they had this new thing they wanted. Now on the other hand, they were paying a monopoly price for it. So we are better off in a world with Apple Cinnamon Cheerios than without it.

But we're still not as well off if there wasn't more competition [INAUDIBLE] Apple Cinnamon Cheerios. So it doesn't mean-- in other words, in economists, we talked about the first fundamental welfare theorem-- the best we can do. We also talk about the second best, which is well, the best we can do, given constraints we live under.

So having Apple Cinnamon Cheerios is the best we could do. It's the second best. We are better off having Apple Cinnamon Cheerios than not. But the first best would be Apple Cinnamon Cheerios with a regulated price at the perfectly competitive price, or at least above it enough to invent new products.

So indeed, today, only five firms make most cereals-- five firms. There are 5,000 types of cereal-- 5,000. So that raises another interesting issue. So overall economistic product differentiation is good. We think essentially it's driving variety. People like variety. If they didn't, they wouldn't buy it. That's good.

But there's starting to be an interesting question in industrial organization of the problem of choice overload, which is in some sense, are we actually-- do we have too many choices? In economics, we assume more choice is good. That's our fundamental assumption. But what if now you get to the supermarket, you look at now, you're like, [AUDIO OUT] it, I'm going to have toast. Because you're like, I just can't decide. There's so much.

Well, you could get to the point where you're actually worse off from that much product differentiation. That wouldn't be in a standard model. That's looking forward to something we'll cover in the next to last lecture. We call it behavioral economics, which I'm so excited about, I dropped my mic. I guess that's a mic drop. So that's in behavioral economics. We'll talk about this.

But the point is, the standard economic model would say that, as this person correctly answered, more product differentiation is good. But there's two caveats to that. One is, it's still not as good as if we had it at competitive prices, just like patents are good, but it's still not as good as at competitive prices.

And the second issue is, there's a question whether product differentiation can actually go too far or can you get choice overload. And that leads us to more interesting psychological models of behavior that we'll come to when talk about behavioral economics. OK. Questions about that? OK. Let's stop there and we will come back next week.