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**JONATHAN
GRUBER:**

OK, so let's continue our discussion of monopolies. Last time, we talked about monopolies and talked about how they're another extreme of the market structure spectrum. We have perfectly competitive firms, where there's facing a perfectly elastic demand curve, and competing with essentially infinite number of other firms and taking prices, versus a monopolist who owns the market and sets the price, but therefore, faces this poisoning effect, which leads them to under-produce and creates deadweight loss.

So today, we want to continue our discussion of monopolies with three sort of separate topics. OK, the first topic I want to cover is, where do monopolies come from? So the stork does not bring monopolies. They come from somewhere else. So sort of, how do monopolies arise?

And there's really two sources of monopoly that I want to focus on today. The first is monopolies that arise from cost advantages, the monopolies that arise from cost advantages. So some markets come with a natural built-in cost advantage for one participant. So it could be there's an essential input, like there's one rock quarry in town. And whoever controls the rock quarry, they supply the rocks for the whole area. In that case, we say that this is an example of a natural monopoly.

A natural monopoly is a market where, for all relevant quantities, one firm can always produce at a lower average cost than another firm can. So for all relevant quantities, one firm can always produce at a lower average cost than can other firms. OK, this basically is the same as saying that it's a market where average cost is everywhere declining, at least in the relevant production range. You can imagine where, so for some crazy quantities, average cost increases. But where average costs is everywhere declining is a market with a natural monopoly.

So why would this be true? Let's consider what I think is the simplest case. Let's

think about a water utility, delivering water to people's houses through pipes underground. Once those pipes are laid, it is that the giant fixed costs are paid, and the marginal costs are trivial. It's the cost of the water. The fixed costs are so large relative to the marginal costs that average cost always declines.

In our typical production function, remember, average cost first declines, then goes back up. It first declines, you pay off the fixed costs, then back up as the rising marginal costs start to dominate. This is a market where that second purchase never gets big enough, say where, essentially, marginal productivity is close to flat, so the marginal cost curve isn't rising that fast, and/or the fixed costs are enormous.

So we could see that in figure 12.1. Imagine a water utility, which has roughly flat marginal cost. That is, the marginal cost is the cost of procuring another gallon of water. Now once again, at some point, if you want to give every person in America one million gallons of water, marginal costs would start to rise. But for the relevant range, it's roughly flat. And yet there's enormous fixed costs. You got to lay those water pipes.

So in that world, average cost is everywhere declining. It's approaching marginal cost, but it never crosses marginal cost. In such a world, once one firm has laid the pipes that's providing water, it never makes sense for another firm to enter. Entry never makes sense. Why is that? Because if another firm thinks about entering, they can say, oh, look this water utility is making all this money, this is a great market to enter-- remember, we talked about unlimited entry and exit and perfect competition that drives profits away.

Well, let's say another firm says, look at all this profits, I want into this market. The first firm will say, I'm just going to tell you right now, if you enter this market, I will price at marginal cost until you leave. For the first firm, they've already paid to lay down the pipes, so as long as they're pricing at marginal cost, they're not losing money. But for the second firm, they will lose money if the firm stays at marginal cost. So they'll just never enter. Because they know the first firm has a barrier to entry.

They have a natural monopoly, having laid down those pipes. Having already paid that fixed cost, that sunk, they will win any battle. They'll just price at or near

marginal cost and drive any competitors out of the market. So these kinds of essentially natural monopolies arise when enormous fixed costs create a barrier to entry when enormous fixed costs create a barrier to entry. You can see natural monopoly. And that's one common way monopolies arise in the world. Think of utilities. Delivering water is a classic example of that. That's one way we get monopolies.

The second way we get monopolies is through government action. Governments also create monopolies remember, today I told you we talk about governments as good guys. But still governments can do things which can create deadweight loss. And now sometimes, governments do this for a good reason, like a natural monopoly reason, like the postal service for example. Local postal delivery, delivering letters locally, has all the features of a natural monopoly. It's a huge fixed cost of building all the post offices and a small marginal cost of transmitting letters from place to place.

Now however, in other cases, this is not necessarily true. In the US, we have very few government-created monopolies. The rest of the world, especially in the developing, it's much more common. Many countries have the government control the production of steel, the airlines are controlled by the government, banking is often controlled by the government. These are places where probably evidence suggests it would be more efficient to not have the government control this. There is no real natural monopoly in banking. But it's more for political reasons that they're created.

But that's not really that relevant in the US. Even the post office isn't a monopoly anymore, with FedEx and UPS and stuff. So it's not really relevant in the US. The more relevant for the US, way that the government creates monopoly is by creating barriers to entry. The government could create barriers to entry, the most prominent of which is patents.

The most prominent barrier to entry is a patent. This is the case where the fixed cost here isn't building a pipe. It's coming up with an idea. And that basically the government has a law which says that, if you have a new idea and you patent it, you are granted a monopoly to sell the resulting good for 20 years from the date of patent. So when you patent a good, you're granted the right to a monopoly over

that market for 20 years.

Essentially, the government is creating a monopoly. It's saying, once you've patented that-- now remember, very importantly-- especially for drug development-- it's not the date at which the good comes to market. It's the date at which you file. So if you file for a patent and it takes you 19 years to develop the product, then you only get one year monopoly in the market. So it's the sum. 20 years is both the development period and the sales period. You get 20 years from the date you file.

Now, patents are quite interesting because the welfare implications are kind of mixed. On the one hand, a patent, by creating monopoly, creates deadweight loss. For potentially up to 20 years, you've got deadweight loss in that market, because one firm has the monopoly right to sell the good. On the other hand, why might patents be a good idea. Yeah.

AUDIENCE: [INAUDIBLE] for developing drugs, the company that can't ever make any money off of its research and development costs will never be incentivized to develop it [INAUDIBLE].

JONATHAN GRUBER: Right. Because research and development is a huge fixed cost. And if you pay that huge fixed cost, and the minute you develop it someone else can just copy you, then you'd never invest those fixed costs. We'll talk later in the course about externalities. But you think of this as sort of a positive spillover from R&D. When firms do R&D, when a firm invents something, it benefits everybody who might produce that good. So if I invent something, then everybody could copy me, could benefit.

So I will not invest in R&D unless I can be sure I might get some money out of it. And that's what the patent does. It reduces those spillovers by saying, OK, you get to own this for 20 years and make some money on it. Therefore, go ahead and invest. In other words, what a patent does is, essentially, the government's saying, you're going to get a reward for being first to market. And that reward is 20 years of privilege of being a monopolist in a market. Therefore, that's an incentive for you to go and invent. Yeah.

AUDIENCE: What's the process like for extending your patent? Because I know Disney, for example, has [INAUDIBLE] which is giving them more years than what they had?

JONATHAN GRUBER:

That's a very detailed concept that I don't have enough time to get into, but there's a whole bunch of legal battles around that. But the bottom line is, there's a patent tradeoff here. The tradeoff is, on the one hand, it's what we call a static versus dynamic tradeoff, sort of today versus the future. At any point in time, there's a ton of deadweight loss out there, because monopolists who have patents are under-producing.

At the same time, over time, we're getting cool new products because of patents. And that's the tradeoff. How did 20 years get picked? Ideally, you'd have some optimal period to resolve that tradeoff, the ultimate result of a tradeoff long enough to get creation, but short enough so that the gains on that creation don't exceed the deadweight loss from monopoly. And that's an example how a monopoly can arise from a government action.

And the point is that, for both natural monopolies and patents, there are legitimate reasons for monopolies to arise. So what I want to say is, monopolies are not bad. They're not necessarily an inherent flaw in the system. There are legitimate reasons to have monopolies, both because of natural monopoly and because of patent. But they do, at any point in time, create deadweight loss. Yeah.

AUDIENCE:

Is there a way to measure how the impact of [INAUDIBLE] something that receives patent, like how [INAUDIBLE] that relates to the deadweight loss [INAUDIBLE]?

JONATHAN GRUBER:

It's a great question. There are people who do spend their lives doing that. And basically, the way you would do it is you would essentially measure the consumer surplus created from the new good, versus-- it would be the triangle sizes. It would be, how much consumer surplus would you get from the new good versus deadweight loss from that good sales being restricted.

Now obviously, if it's a good that never would have existed otherwise, by definition, the patent's a good thing. Because who cares about deadweight loss if you never would have had it in the first place. The question really is about the substitutability. If you're patenting something which is only incrementally better, then maybe it's not worth it. So that's sort of the tradeoff. Other questions?

OK, so now let's talk about addressing or regulating monopolies. Let's go back to

think about our natural monopoly case. Let's think about our natural monopoly case. Actually, I'm going to call this section not regulating. I'm going to call this addressing monopolies, addressing monopolies. There are different ways that we can address monopolies. And we'll go back to our natural monopoly case to make it easy.

The first way we can address monopoly is through government regulation. So let's step back here. The bottom line is, we have a monopoly that should exist, say a natural monopoly. It exists naturally. At the same time, that is creating a deadweight loss. It's creating inefficiency.

So the brilliance, the insight of the first fundamental theorem of all for economics was, the competition through entry and exit will bring us the efficient production level and reduce deadweight loss. Here with a natural monopoly, that doesn't work. Competition can't work, therefore, we end up with a deadweight loss, because the firm that owns the market is under-producing.

This is the first case, as I mentioned last time, of what we call a market failure. The market outcome is not delivering the welfare-maximizing result. And once there's a market failure, there is a potential beneficial role for government. I said last time, with no market failures, government's just the bad guy. With no market failures, all government can do, it can help with the redistribution. But from an efficiency perspective, all the government can do is muck up the market. But once there's a market failure, there's a potential role for the government addressing it.

So to see that, let's return to our monopoly example from last time in figure 12.2. Figure 12.2 is our monopoly example from last time. Remember, we had demand curve that was $Q = 24 - P$. We had a cost curve that delivered the marginal cost of $MC = 2Q$. And that's graphed here. And we said last time that the monopoly outcome would be at E sub M. The monopolist would sell 6 units at the price of 18, creating a deadweight loss of C plus E.

Now, what if the government came along and simply mandated that the monopolist was not allowed to charge more than 16? The government says, look, I understand it's a monopoly. I'm not going to try to break up the monopoly. It's a natural monopoly, whatever. Simple rule-- price ceiling of 16. Now, when I mentioned

pricing a couple of lectures ago, you should have learned to say, boo, price ceilings, bad, increase deadweight loss, terrible.

But now, suddenly a price ceiling can actually get rid of deadweight loss. How's that possible? Let's take a look. In this case, the monopolist knew marginal revenue curve is a bit different. The new marginal revenue curve is the old marginal revenue curve, until you get to the point where the first dashed line intersects marginal revenue. It's the old marginal revenue curve, until you get where the marginal cost crosses marginal revenue.

Then it jumps to the flat line at 16. Essentially, the new marginal revenue curve is downward sloping till the point where marginal cost equals marginal revenue. Then it jumps back up to the flat part that goes from 6 to 8. Now the exact shape doesn't matter. It's the intuition that matters. The point is the following. Think about the monopolist's decision. He decides, based on the logic of the last time, to sell six units. That's the point where the poisoning effect offsets the benefits of selling another unit.

Now let's say the government comes and says, monopolists, you can't charge more than 16. Well, once a monopolist is forced to charge 16, now think about her decision to sell the seventh unit. Well, before she didn't want to sell the seventh unit, because selling the seventh unit meant she had to lower the price to 17. Well now she has to lower the price to 16 already, so why not sell the seventh unit? Indeed, why not sell the eighth unit?

We've essentially gotten rid of the poisoning effect by pre-poisoning them, by already telling them, look, you can't charge more than 16. There's no way to charge more than that, so you might as well sell eight units. So by telling the monopolist they have to charge a competitive price, you will force them to sell the competitive quantity and you get rid of deadweight loss. That's our first example of how the government has improved things. The government has gotten rid of the deadweight loss by setting a price ceiling. Price ceiling, in a perfect market, is only bad, but a price ceiling here can actually improve things.

So that actually sounds pretty good. So what's the problem? Why not, in reality, just say, hey, we can solve all our monopoly problems by just having the government

regulate the price at the competitive level? What's the problem, in reality, with that solution? Yeah.

AUDIENCE: How would the government know the competitive level?

JONATHAN How the hell does the government know the competitive level? It's great with this chart.

GRUBER: But in reality, the government doesn't know where the competitive level is because there's two difficult points. What does the government need to collect? First of all, the government needs to know what the demand curve is. Well, it turns out demand curves aren't written on our foreheads or out there on the dark web. Demand curves are something which you have to estimate.

You have to gather information from people. And it turns out that it's pretty hard. Because if you want to gather information on what people are willing to pay for apples, you can just go to stores and look at the prices charged for apples. But if you want to gather information on the willingness to pay for getting water delivered to your house, there's no market to turn to. It turns out to be pretty hard to figure out how you value a lot of goods, which is natural monopolies.

Now, you might say, well, why do you just ask people what it's worth to them? You just say to people, look, tell me your demand for water. It turns out that's really hard because people aren't very good at thinking about how to assign prices to things they don't shop for. If I say to you, what's an apple worth, the first thing in your head is, you think about being in a supermarket looking at apples and what they cost.

You don't think about the inherent value to you of consuming an apple. But when you think about what water is worth, you have to think about sort of the inherent value. And so you have to rely on something that we call contingent valuation, which is the economist's fancy word for just asking people what it's worth to them.

The problem is, people aren't very good about that. So for example, a classic case was the rise in environmental issues. How much is it worth to have clean air? How much is it worth to save the Grand Canyon? So it turns out people give sort of crazy answers that violate all the rules we set up in the first lecture by utility functions. Like for example, if you asked folks what it's worth to save the Grand Canyon as a single question, and then you ask them as the third question on the list, it's worth 1/5 as much to save the Grand Canyon as the third question on the list, which

doesn't make any sense. It doesn't matter what the other questions are.

If you ask people, how much they would pay to save seals and whales, in that order, they'd say saving seals is worth \$142 and whales \$195. So whales and seals are about the same. But when you reverse the order, whales are worth about twice what seals are worth, just by reversing the order. Well, more relevantly, if you ask people what it's worth to save a bird or 10 birds or 1,000 birds or a million birds, they give you pretty much the same answer, which doesn't make any sense.

So basically, the problem is these contingent valuation methods don't really give sensible answers. And it's very hard to get sensible answers. In my other course, Public Economics, we talk about lots of interesting clever methods for trying to get people to reveal their preferences for these public goods. But it turns out to be hard. So that's one problem, is it's hard to measure the demand curve.

The other problem is, it's hard to measure the supply curve. Because where does supply curve come from? It's sort of a firm's marginal cost function. You as the regulator do not know what their marginal cost function is. So how do you find out? You ask them. You say, hey, business I'm going to regulate, I'd like to know what your marginal cost is. And by the way, the lower you tell me it is, the lower price I'm going to let you charge.

So what's your marginal cost? Oh, god, our marginal cost is horribly high. It's terrible. You wouldn't believe it, can't complain enough about how high our marginal cost is. And basically, unless the regulator perfectly knows the production function and perfectly knows the input prices, none of which are perfectly known by anybody but the firm, they aren't going to know what the supply curve looks like and what the marginal cost looks like. Question.

AUDIENCE: Couldn't they also, say, in a public company, basically inspect their factory and manufacturing [INAUDIBLE]?

JONATHAN GRUBER: You could absolutely do that and you can try to collect data. But ultimately, they could, that day that you show up with the inspector, have a really expensive-looking setup in their factory or whatever. It's basically very, very hard. So basically, the problem is that regulation-- and this will generally be a feature when we talk about the benefits of government intervention. We'll say, market failure makes it possible

that government intervention can make things better, but not definite.

So the way to think about the logic is, in a perfectly competitive market with no market failure, government intervention only makes things less efficient. We're leaving redistribution aside. It only makes things less efficient. When you move to markets with failure, you open up the possibility that government intervention can make things better, but not for sure that it will. You open up the possibility. It's a necessary but not a sufficient condition for saying the government improves efficiency.

So for example, imagine that the government came in to this market and said, we think the competitive price is 10. We think the competitive price is 10. Well, if the government set the price equal to 10, we know that firms are going to produce where marginal revenue-- which is now just 10, because it's regulated-- equals marginal cost, so where 10 equals $2q$. Little q and big Q are the same because of the monopolist. Where 10 equals $2q$, or where q equals 5.

So if the government comes in and says, we're fixing your price at 10, we know the firm produced five units. Well, with five units, the deadweight loss is even bigger. The key trick with deadweight loss triangles, deadweight loss is essentially proportional to how far you deviate from the optimal point. So the more you move to the left, the bigger the deadweight loss triangle is going to get. So deadweight loss with 5 units sold is bigger than deadweight loss with 6 units sold. So the government's actually made things worse. By coming and setting this price of 10, the government's made things worse.

Indeed, the government could actually set the price so low you shut down. The government could set the price below the shutdown point and wipe the whole business off the map. So here we have the tradeoff. The government can potentially make the market more efficient through price regulation, but it won't necessarily. It depends on its level of information and how well it does setting the price relative to the competitive price.

So basically, this is a very sort of interesting and difficult problem for the government. So one way is through regulation. Questions about that? The other way to try to address monopoly is by saying, is there some way to introduce competition?

That is, even in what feels like a natural monopoly market, is there some way to choose competition?

So for example, think about broadband delivery. Now we're still wired. In the future, it's all wireless. This is different. But it's still wired. The way it works is, broadband delivery has features of a natural monopoly, which is, someone has to lay the wires to your house to deliver it. At the same time, once those wires are laid, it's a 0 marginal cost to allow you to connect to the internet.

So what governments do in other countries, but not the US-- in the US, we have competition. Everybody lays their own lines down. In Europe, they recognize that's inefficient. It's a natural monopoly. What they do is, they have one set of publicly laid lines, and you compete to deliver content over those lines. So there's competition where the monopoly is not natural, which is over the speed and the quality. It's the quality of the connection. But the lines themselves, since that's a giant fixed cost, they realize there can't be competition over that. So that's one way you could try to deal with a natural monopoly. In other words, the government could control the pipes underground delivering the water and have firms compete over delivering the water to you.

So that's one way to deal with it. Another example is to think about the public sector and think about education, education delivery. Now, for those of you who grew up in the US, you are evidence of the success of the US educational system. But you are the exception, not the rule. The US educational system, by international standards, performs very badly. Probably out of the top 30 countries, we're like 15th in terms of things like math scores and other things like that.

Yet, we spend more money per pupil than any other educational system in the world by a large amount. So if you look at figure 12-3, figure 12-3 shows, in the blue, primary school spending per pupil, and in the red, eighth grade math scores. And you can see the US spends way more than other people, but our scores aren't any better. Indeed, it doesn't look like there's a very strong relationship here at all between how much countries spend and what you get in return. But at least it's quite striking how low the US is given how high our spending is.

Now, why is that? One reason is because we have given local schools a monopoly.

We have said to local schools, you have a monopoly where you get to deliver the education to anyone who lives within a certain radius of your school. We've created that natural monopoly. And once we created that natural monopoly, we reduce pressures on firms to produce efficiently. We've essentially said to firms, you have a monopoly. There's no reason you have to produce efficiently. Because there's no entry and exit, which can put those pressures on you.

So in some sense, that's a government-created monopoly. Your local public school is a government-created monopoly. So what can we do for that? What can we do? Well, we can actually introduce competition. So for example, we can have public school choice, which many cities now have, where, in fact, you don't have to go to the school in your neighborhood. You can try to go to any school in the district. You can essentially enter a lottery and try to move around to other schools in the district. And that introduces competition. Because then the schools that want kids will have to be better and have to produce more efficiently.

And then a further mode of that is, you can have charter schools. Charter schools are publicly funded, but not city provided. They're in between public schools and private schools. Charter schools are separate schools, which get funding from the government. But they aren't under the local government's control. Regulatory control, but they aren't delivered by the city as education. And that provides more public school choice for individuals.

And there's a lot of evidence, much of it by my colleagues here at MIT, which shows that there's been enormous benefits to these movements, that public school choice and charter schools have delivered-- now I know some of you might have seen the John Oliver segment a couple of years ago where he ragged on charter schools. I mean, I love him in general, but he was wrong on that one. There's a couple of bad actors. But by and large, charter schools have been an enormous benefit to the education system by introducing competition and allowing students an option to improve their educational outcomes.

Now, the furthest out option, and something you'll hear a lot of discussion of, is vouchers. The most radical option is what we call public school vouchers, or just vouchers. Here's how this would work. This is a very popular idea on the conservative side of the spectrum. Here's how this would work.

So I live in Lexington. What that means is, if I send my kid to a Lexington public school, it's free. But the minute I pull my kid out and send him to a private school, it costs me the entire amount. So imagine a Lexington public school education's worth \$10,000. I'm essentially getting \$10,000, conditional on sending my kids to a Lexington school. The minute I choose to send them elsewhere, I literally give up that \$10,000.

A voucher system would say, the way it would work is, everyone in town would get a check or would get a voucher for \$10,000 to be used at any school they want. So if you want to go in Lexington, you just hand it in. Life's never changed. But now if you want to go to private school, we're allowing you to take your money elsewhere. That puts competitive pressure not just on schools within the district but on the whole district. The whole district now says, wait a second, if we don't do a good job, people are going to leave and take their money elsewhere. So the idea is to actually set up broader competition to put pressure on districts to improve their performance.

So this has been a longtime attractive option to many economists. And I've spent a whole long time talking about the pros and cons of this in my other class. But briefly speaking, the pros are all the reasons we like competition in markets. It'll cause more production efficiency because schools would have to compete. The cons are numerous, though. One con is, you then have to have the public sector that has a vested interest in making sure private schools are delivering a public quality education.

So basically, you could set up a private school that is just a football training academy. And suddenly, people could take their voucher and go there, and suddenly they wouldn't get education. That's one con. Another con of these systems is that they're expensive. So take me. I live in Lexington. I'm a pretty rich guy. I sent my kids to private school. I sent them and I paid.

Now, imagine Lexington had a voucher system and they give me a check for \$10,000. Why should Lexington give a relatively rich guy \$10,000? That's sort of silly. I was already sending my kids to private school. So who would be the big winner from a system like this? Well, some winners would be kids who then get a better education.

But a lot of winners would be rich people who already sent their kids to private school. We'd just be handing them checks. That's not a great outcome. So there are definitely tradeoffs inherent in a system like this. I know there's a few questions. Let's do a couple of questions, then we'll move on. Yeah, in the back.

AUDIENCE: So say you have these vouchers, and instead of going to the public school, students are leaving to the private school, and then the fixed cost of having the infrastructure of a public school, that's then spread out over less students. So how do you account for, the price of teaching one student might go up if there are these students that are leaving?

JONATHAN GRUBER: That is an awesome question. There's two elements to that. Question one is, there is an actual natural monopoly feature to local public education. So remember, competition doesn't make sense when it's a true natural monopoly. There is some natural monopoly element. So as you shrink the number, you suddenly are raising the average cost. And that is a potential problem. There's an efficiency issue.

There's also an equity issue, which is, who uses the vouchers and leaves? The people with motivated parents who are with it. Who gets left behind? People's parents who don't give a shit about him. There's an equity issue, too, of, suddenly, you're pulling all the smart kids, all the motivated kids out of the public schools and leaving the kids behind who aren't motivated or whose parents aren't motivated. There's an equity issue there, too, so that's another tradeoff. Yeah.

AUDIENCE: You got a good education.

JONATHAN GRUBER: How do you tell if people get a good education? Well, that's [INAUDIBLE].

AUDIENCE: Well, if you're going to get a good education.

JONATHAN GRUBER: Well, that's another problem. Which is, competition, one of our fundamental assumptions of perfect competition was perfect information. That's fine when you're looking at apples or maybe even computers. It's not so easy looking at schools. Now, schools publish test scores. You can look at the test scores of kids who go to that school. But once again, that's not that reliable, because if smart kids are going to the school, they'll have high test scores, even if teachers suck. For

example, Harvard-- sorry, I couldn't resist.

[LAUGHTER]

So basically, you can't really tell that. In other words, there's a number of failures of the private education market, that are a problem with this kind of voucher solution. But it doesn't mean it's wrong. It means it's interesting. There's a tradeoff. On the one hand, we'd introduce competition, which would maybe increase efficiency in the market. On the other hand, there's a lot of market failures which might get in the way of this functioning properly. Fascinating topic, and if you want to learn more, I urge you take 1441. We spend a whole lecture talking about it.

So that was the second topic I want to talk about. Once again, we've started down the road of questioning the wisdom of the market, so the road of market failures. The first market fail is monopoly. We've talked about the pros and cons of trying to deal with monopoly. But I want to talk about one other topic before we leave monopolies, which is this topic of what we call contestable markets, which is sort of an informal term. But I really like it as an intuition, so I'd like to spend some time on it.

Contestable markets are monopoly markets without market power or without much market power. That is, we talked about monopolists as having lots of market power. Remember, we said the markup was essentially proportional. We said that monopolists had a markup, price minus marginal cost over price, which is equal to minus 1 over the elasticity of demand. That was their markup. And so you know some markets, different monopoly markets will have different levels of market power. You can be a monopolist, but not have much market power if consumers are very elastic.

But there's another reason why monopolists face pressure besides the elasticity of demand, which is, in some sense, the size of the barrier to entry. So one reason monopolists are constrained in their pricing is because demand's elastic. Another reason is because the barriers to entry might not be that large. So you could think of it, roughly speaking, for a given elasticity of demand, the larger the barrier to entry, the more market power you have. Because the larger the barrier to entry, the more you can be sure no other firm's going to come in.

Or in other words, the amount to which you can charge above marginal cost for a given elasticity is proportional to how severe the barriers to entry are. If there's no way a second firm can get in, then essentially, you get to just obey this formula. But if a second firm can get in easily, then you might not even be able to have this big a markup. Because if you try, someone's going to come in and steal your profits. So in other words, there's essentially an important issue, which is that the market monopolists can get as a function both of elastic demand and the size of their barriers to entry.

This is an important issue that came up in the area of airline deregulation, which is what I want to talk about for a few minutes. It's an important application of the kind of stuff we've been talking about. Now, how many of you have seen *Mad Men*. Jeez, really? Wow, OK, it's a pretty good show. I mean, it's not outstanding. How many have seen *Breaking Bad*? OK, good. That, you have to all see. *Mad Men's* pretty good.

But basically, what's nice about *Mad Men*, it shows what flying was like when I was a kid. When I was a kid, when you flew, it was like luxurious. You went on, there was plenty of leg room. You had free meals, free movies, free drinks. And the reason was because-- I sort of skipped ahead in the story. When I was a kid, airlines were regulated. What that meant was that, essentially, the government viewed airlines as a natural monopoly. They said, look, planes are very expensive. There's a big fixed cost, so it's a natural monopoly. We don't think competition will work well here, so we're going to have regulation of airlines.

What that meant was, the government set the price of every flight and regulated where planes could go. So airlines every year would submit a set of routes they wanted to fly and a set of prices. And the government would approve or turn them down. It was a regulated market. And it was generally viewed that the government basically sort of screwed this up and set the rates too high. That was sort of the general view, that, basically, government, because, essentially, they didn't really understand the supply curve, they were being fooled by the airlines to think costs were higher than they were and were setting prices too high.

But economists said, look, this is not a natural monopoly. Because in fact, it's not actually that cheap to get a used plane and enter this business. Because these

companies turn over their planes all the time. And yes, buying a new plane's expensive. But getting a well-functioning used plane isn't that expensive. And you could easily create competitors in this business.

They said it was what we called a contestable market, a market with very low barriers to entry, that, in fact, if you allowed competition, you would have a lot of entry into this market. And it would function fine, that it wasn't a natural monopoly, it was a contestable market. And they argued, in fact, that if you lacked competition, price would fall very close to marginal cost. Price could fall very close to marginal cost.

So in fact, economists carried the day. In the 1970s, we deregulated the airline industry. The government stopped setting prices and regulating routes. What happened? OK, three things happened. The first thing is, price fell enormously. The cost of flying fell by about 1/3.

The best example was the airline I took home from MIT in 1984 called People Express. People Express Airlines introduced-- this was sort of shortly after deregulation. I could fly from Boston to Newark for \$29. Now, how did that work? It was crazy. You showed up at the airport. There was no reservations. You just waited on line.

They let people on until the plane was full. Then you waited for the next one. You paid on the plane with a credit card. I still to this day don't know what happened if you didn't pay. Did they throw you out the window? I don't know. But you paid on the plane. And it was incredibly competitive. And this is what happened. Flying got incredibly cheap.

The second thing that happened is you had many more routes. It turned out that the government thought that flying from point A to point B wasn't profitable often when it was. So the government wouldn't let airlines flight from point A to point B, when, in fact, airlines could make plenty of money doing that flight. So you had cheaper flights and more routes.

The third thing is, flying sucks. When I was a kid, flying was awesome-- meals, booze, big seats. Now it's terrible-- no meals, no booze, tiny seats. Why? Why did this

happen? Flights got cheaper and there are more of them, but why were they suddenly crappier? Yeah.

AUDIENCE: There was more competition so they were trying to bring down the marginal cost so bring prices lower.

JONATHAN GRUBER: Right, that's one way to put it. But the point is, what this example points out is that there's always competition. Yeah, what were you going to say?

AUDIENCE: I was going to say price discrimination. They could discriminate based on what people [INAUDIBLE]

JONATHAN GRUBER: It actually wasn't. They still price discriminate. It wasn't quite that. But yeah.

AUDIENCE: People were willing to fly [INAUDIBLE]

JONATHAN GRUBER: They were willing to fly. But what were they doing before? Yeah.

AUDIENCE: If you couldn't compete on price, you could compete on luxuriousness.

JONATHAN GRUBER: Right. So there were multiple airlines before. The government said we'll only compete on price. But they said, great, we'll compete on other stuff. Remember, economic actors want to be economic actors. They want to use economic tools. So if the government says to airlines, we're not going to let you charge a higher price, they're like great, we'll compete by having better food, better drinks, bigger seats. Once the government said, now you have a new mode of competing, they realized people weren't willing to pay for better food and better drinks and bigger seats. They'd rather fly cheaper.

So they switched the mode of competition from quality competition to price competition. They used to use quality competition. Now they use price competition. This means that all of us who complain that flying sucks should just shut up. Because if we really cared that much, then there'd be a good airline that charged more and gave you better stuff. But there's not. I mean, JetBlue's a little better. But by and large, there's not airlines that charge more and give you better stuff.

And that's because, at the end of the day, we would rather fly cheaper than have this extra stuff. It wasn't worth the money that we were paying for it. Which really says that regulation was failing here. Regulation was forcing airlines to compete in an inefficient way. They're competing by giving us nice meals when we would rather have the money. So it was an example that regulation failed.

So that's all really good news. But there's one piece of bad news, which is that, economists aren't all-knowing. And the economists, there's a fourth outcome we missed, which was the rise of the hub and spoke system. Which is that what we missed is that airplanes aren't a natural monopoly, but airports are. And what airlines started doing is essentially taking over airport slots, and then saying, we are going to have all the flights.

So for example, my wife is from Minneapolis. We used to go to Minneapolis, the only option was Northwest. Northwest owned all the slots in the Minneapolis airport. And they'd say, if you ever fly anywhere on Northwest, we're going to route you from Minneapolis to wherever you go. It was called the hub and spoke system. You always went to a central point and went out. So US Air had Pittsburgh. Northwest had Minneapolis. American had Dallas, et cetera. They had these hubs that you'd go through.

What that meant was, they essentially got a monopoly on the route into the hubs, because they had monopoly on the slots in the airport. Now you might say, well, that's easy to fix. Don't give monopoly slots in the airport. But that's harder to fix than you think. Because whenever the airport in Minneapolis would say to Northwest, we want to allow other airlines, they'd say, great, we're moving our headquarters out of Minneapolis. See ya. And they'd say, OK, fine, we won't do that.

So essentially, there became political equilibrium where these local airlines were such big employers, they'd bully the governments into letting them dominate the airports. And they essentially recreated a monopoly. But the monopoly wasn't on planes. It was on airport slots. And actually, flying got much more expensive again. So the price of flights really came down until airlines figured out this hub and spoke system, and they've gone back up since.

Now, they're still cheaper than they were under regulation. But roughly speaking,

the price fell by more like more than 50% initially, and then sort of risen back up. It's still lower than it was under regulation. But it's risen back up because there's this sort of new natural monopoly problem that we didn't see. So that leads to crazy things, like a price of a nonstop to San Francisco today is something like half as much from Boston as a flight to Minnesota. Now, I don't know how your geography skills are, but San Francisco's a lot farther from Boston than Minnesota is, so it's clearly not a marginal cost issue.

So that's an example. It's sort of a nice case study of kind of, our motivation was right, by and large economists got it right. By and large, we're better off in a deregulated world. But not as well off as we thought, because we missed this other element of natural monopoly. Why don't I stop there. We will continue next time by talking about oligopoly.