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PROFESSOR: So today, we're continuing our discussion of chapter 23. Remember, we're talking about how taxes affect behavior. We talked about savings and labor supply. And now we're talking about risk-taking. And now we'll turn to taxes on wealth.

This is relevant for a particular reason, which is in the next few decades, the US will undergo the greatest transfer of wealth in our nation's history. Currently, the Baby Boomers, your parents, are sitting on-- and your parents and their parents-- are sitting on about $84 trillion in assets that they are going to leave to their descendants. That amounts to about 81% of all the wealth in America will be transferred over the coming decades to future generations, hopefully yourselves.

And this raises the important issue of, should that be a taxable event? And how should it be taxed? This massive transfer of assets, how should that be taxed?

Now in the US, we have a system what's called transfer taxes. And they come in two forms. The first form is the gift tax. Well, let me start. The first one is the estate tax.

The way the estate tax works is when you die, the money you leave behind that gets transferred to descendants gets taxed, but only above $12 million for a couple. So basically, for the first $12 million you leave, it does not get taxed. Once you're leaving above $12 million, there's then a marginal tax rate in the above $12 million, with rates that rise from 18% to 40%.

So this tax, this is what happens when you die. Now along the way, you could say, well, then you could just say, look, that's easy. I could just transfer all the money to my kid the day before I die. Then I don't pay that tax. Well, the government wised up to that.

And we also-- we have what's called a gift tax, which is gift tax exemption, which basically, in any year, you can give-- it says $15,000 in the textbook. It's now up to $18,000. You can give $18,000 a year to any person. And that is tax-free to them. And it can be deducted from your estate.

So let's say I'm going to die with-- the exemption is $11.6 million. Say I'm going to die with $11.6 million plus $18,000. The year before I die, I can give that $18,000 to my kid. And then I will have no estate tax when I die because that money will be out. Here's our guy who likes to have-- go ahead.

AUDIENCE: Is it $18k per person?

PROFESSOR: It's actually better than that. It's 18k per person per person you give to. So if you're a married couple with three kids and six grandkids, each of you can give away nine 18ks. So you can, as a couple, give away 18 18ks, because you can give it to each of your children and each of your grandchildren.

So basically-- and you can do that without-- but anything you give above that, they're going to subtract from your 11.6. So if you give away 100,000 they'll say great. The first 18k is tax exempt. But the remaining 82, we're going to now say when you die, you don't get 11.6. You 11.518 as your exemption.

So basically it's an integrated set. Together, these make what we call an integrated set of transfer taxes. We can transfer while you're alive or when you're dead. Ultimately, the bottom line is at least 11.6 million of those transfers are tax exempt. More than that is tax exempt if you do it while you're alive, up to these limits.

Striking fact, there's incredibly little use of gifts even among people who eventually face the estate tax. People massively underuse the ability to give gifts to your kids along the way relative to the estate tax. Interesting theories as to why.

The best theory is that people just don't trust their kids. Either they don't trust them, so they don't give them the money, or they don't trust them because they're afraid they'll give it away and then the kids won't take care of them when they're old. But it is a fascinating fact that, in fact, there's a lot of money being left on the table in terms of excess estate taxes paid by people who could be giving money along the way and aren't.

Now, the US is not the only country that has estate taxes. If you look at Table 23.2, this shows how wealth and transfers-- yeah?

AUDIENCE: [INAUDIBLE]

PROFESSOR: I'm going to get to those. Around the world, there's also transfer taxes. You can see that on average, in the OECD, 0.3% of revenue is raised from transfer taxes. In the United States, it's 0.5% of revenue. So about one in every $20 the government raises is from transfer taxes.

Some other countries also have wealth taxes. This is different. This is not a tax on the transfer of wealth. It is literally a tax every year on your level of wealth. And we'll come back to that. That's something that's been proposed in the US. That would be very different than we've discussed so far. Everything we've discussed so far is taxes on flows, your flow of labor income, your flow of savings, your flow of transfers. This is literally a tax on a stock.

As you can see, not many countries do that. Switzerland does it the most. Actually, one in every $20 they raise-- I should have said one in every $200. When I said half a percent, one in every $200. One in every $20 Switzerland raises is from the wealth tax. So let me correct my previous statement. One in every $200 the US raises is from the wealth tax. One in every $20 Switzerland raises is from the estate tax. One in every $20 Switzerland raises from their wealth tax.

Put it all together, and the US is somewhat below average. The average OECD country raised about almost 0.8% of their revenues from wealth and transfer taxes. The US, it's 0.5. So this is not unique to the US.

So why do countries have these? Let's focus now on the transfer tax part. We'll come back to the wealth tax part later. Let's focus on the transfer tax part. Why do countries have these transfer taxes?

Well, there's basically one most important argument, which this is the single most progressive tax that exists known to mankind, I would argue. So in the US in 2020, 0.1% of decedents paid the estate tax-- 0.1%. So that means we raise 0.5% of our entire federal revenues of 0.1% of people who die. That's pretty amazing. The average estate tax rate was about 17%. So on average, 0.1% of people are paying about 17% of their estates to the government.

So for example, if just a simple example of the importance of this-- if, in 2009, we exempted 3.5 million from estate tax-- today it's 11.6 million. If we returned to 3.5 million, we would raise 27 billion more every single year. And in doing so, we would only apply-- it would only go from applying to-- it would only apply to-- so going further, if we exempted it, if we lowered it to 1 million, we could raise almost 800 billion over the next decade.

So there's a lot of money at stake here in this exemption. So that's the main argument that we tax wealth, that we might tax transfers. Another argument is a political argument, which is that basically political systems fail when there's more of a concentration of power in the hands of particularly interested parties, and that the transfer tax is a way to reduce the concentration of wealth in the US, that rich families don't always stay rich, but that you need to become rich through hard work. And then in particular, we don't want an aristocracy of the rich that continually stay rich just because they made a lot of money in the past.

So that's the argument for the estate tax, largely progressivity/political argument. There are a number of arguments, however, against the estate tax. And it's very controversial, one of our most controversial taxes. What are the arguments against it?

The first tax is that it's just darn cruel, that someone just died, you go to the family and say, hey, sorry your dad died, but write us a check. That seems kind of unfair. Now, that argument is-- that is really not, I think, a particularly compelling argument in the sense that it's the right time to do it, in the sense that when you die, that's when we get your assets together and figure out what you owe. So we're going to tax people on their wealth or anything approximating their wealth. That's the time to do it.

So it's also true that like taxes in general, it's hard to say why taxing a rich guy when he died is more cruel than taxing a low-income worker when they go to buy hamburgers with the sales tax. It's not clear how that's more cruel. So that's kind of a silly argument.

There is a more rigorous argument, which is that the estate tax is essentially double taxation. The idea is you paid taxes your whole life, you die, and then you're going to pay tax again on what you saved. And that seems a bit unfair. In particular, more than unfair, it might actually deter people from saving, because if you're going to save and then just pay back to the government, why save? And as we talked about, we're concerned about low levels of savings in America. So that's a particular concern.

Now there are three problems with this argument. This argument has-- yeah?

AUDIENCE: [INAUDIBLE] The people who are at that margin are not the people who are concerned about not saving enough.

PROFESSOR: Well, no, no. Well hold on. If we care, there's two different reasons we care about saving. There's making sure people can smooth their consumption through shocks and have something to retire on. And then there's the aggregate capital stock. For the aggregate capital stock, that's exactly are the people we care about because they do most of the savings. The rich who do most of the savings exactly are the people we care about.

So now there's three counterarguments. The first is-- I always go back to this old saw, which is, given income and substitution effects, we don't know which way this goes. We don't know if taxing estates leads to smaller states or bigger estates. If your goal is to leave a fixed amount of money to your kids, then estate taxes will lead to bigger estates. So it's not clear which way it goes. That's argument one.

Argument two is that much like the death tax is cruel, double taxation is cruel, it's also a silly argument. We all face double taxation every day when we buy anything that pays the sales tax. We paid taxes on our wages. Now we're paying taxes on our sales. Why should we get rid of the double taxation of incredibly rich people, but leave it in place for the rest of us through sales taxation? So that seems kind of a weak argument.

And then finally, there's an important conceptual point this misses, which is if you remember when we talked about the tax favoritism towards capital gains, I mentioned you could exempt $500,000 of your house. I mentioned the rate's lower. I also then quickly mentioned something called the step up in basis at death, which is that when you die, the basis at which you sell assets gets raised to value when you die.

So once again, remember the example. If I have a painting I bought for $10 and it's now worth a million, if I sell it the day before I die, I pay capital gains on the million minus 10. If I leave it to my kid and he sells it the next day, they pay no capital gains because the basis is raised to a million. What does that mean? That means capital gains are never taxed absent the estate tax.

So the argument of double taxation is actually wrong. For capital gains, it's single taxation. Absent the estate tax with this step up, capital gains would never face taxation if you passed it on to your kids. So in some sense, it's not just-- it's double taxation in some sense, but it's also, for capital gains, single taxation. So that's another weakness of this argument. Nonetheless, it's a legit argument, theoretically.

Another argument is that this is just an enormously complicated tax to administer. It's just hard to figure out what people's assets are to add it all together, to put it all together. And also, you're basically saying to people, hey, grandpa died. He's got this farm worth $20 million. You kids have to pay us $2 million. And the kids are like, we can't pay that without selling the farm. You're going to force me to sell the farm. This is a common argument against these kind of wealth taxes, is people just can't afford it at that time.

Now it turns out-- and that is the number one argument against estate taxes. It's all about the farmers, man. If you look at people who oppose state taxes, or what they call the death tax, it's all about these poor farmers. Well, it turns out that in 2013, when the exemption was half of what it is today, 80 farms and small businesses paid the estate tax. 80. This is, once again, another red herring that's used to oppose what's very progressive taxation.

The truth is we also have a system where when the estate tax is owed, you can pay it back over 17 years. So you can essentially take a loan out against your farm to pay it back. So it's, once again, not a super compelling argument.

But the final argument, I think, is probably the most compelling and the most interesting, which is that basically, the estate tax is a tax on the unprepared or, to be less charitable, a tax on the stupid, which is that basically, with good tax planning, you can avoid a lot of the estate tax. So for example, if you give away those gifts every year, you can avoid the estate tax.

Second of all, you can set up what's called trusts. This was Steven's earlier question. You can set up a trust where basically, what that means is you can put away money. Let's say you want to leave money to your kids, but you don't want to give your six-year-old kid $18,000. You put it in a trust. And then every year, you can leave money to all your decedents-- in fact, anyone you know. It doesn't have to be a decedent. You can leave money to anyone into this trust, and they can't get it till they're older. So you can deal with your desire for control and your desire to avoid taxes in that way.

Moreover, it's even worse than that. If you leave stock in a trust, the entire appreciation is tax free. So if I put a stock in a trust and it goes through the roof, then basically, the kids get that all tax-free. So basically, there's a lot of argument that, essentially, these loopholes mean that it's really unfair. It's unfair to have a tax where the more sophisticated people can basically largely avoid it, and the less sophisticated can't.

I think that's a legitimate point. I mean, there's a really interesting philosophical question about, do we want policies in America that, think about the extreme, that aren't enforceable? Probably not, because it deters faith in government and doesn't do any good. So if you literally thought about a law which was annoying and totally avoidable, that's probably a very bad law.

So basically, the question is, does the estate tax cross that line? I would argue not. I would argue yeah, there's some avoidance. But at the end of the day, it does raise about $20 billion a year. That's a lot of money you raised off the top 0.1% of richest families every year-- richest families who die every year. So I would argue that while that's a legitimate argument, it's hard to say it's large enough to offset $20 billion a year in revenue. But it is a legitimate argument. Yeah?

AUDIENCE: [INAUDIBLE] growth in trust happens in a similar [INAUDIBLE] basis, then? Or how is it that can happen?

PROFESSOR: It's just the way trusts work. Anything I put in a trust, then it's just if I'm putting stock in a trust and then it grows. It's the same with-- by the way, you were too young. But when Mitt Romney ran for president in 2012, it turned out he had like $5 million in his IRA or $50 million in his IRA. Well you might say, with a limit of $6,000 a year, how could he have $50 million? Because he put stock in and that all grew.

Now the IRA, of course, what he takes out will be taxed. With the trust, it won't be taxed. So--

AUDIENCE: Do people ever invest not through a trust [INAUDIBLE] they're a beneficiary?

PROFESSOR: Well, you can't make yourself the only beneficiary. Someone else has to be the beneficiary. And there has to be an objective trustee. There's various hurdles you have to go through.

So that's the estate tax debate, which I think is largely pretty-- I'm being pretty calm. Usually, I get more irate about this. It's pretty straightforward that we should have higher estate taxes. That's a very progressive way to raise revenue. It's hard to argue there's a lot of negative effects of it.

Unfortunately, what's interesting is the taxes that seem to make the people most upset are taxes on stocks, not flows. So we'll talk later about the property tax on homes. That's another tax that gets people really, really upset, because the theory is, wait a second. I've just got this asset. It's sitting there. And you want to tax me on it? That seems unfair.

When I earn income, I see I'm making something. You just want to tax me on that. That seems unfair. And that leads us to the debate over wealth taxation. So, as you know, in the 2020 presidential election, a big topic of conversation was wealth taxation. Elizabeth Warren made a lot of news by proposing a wealth tax. She proposed a wealth tax of 2% on people with assets over $50 million.

So that's only the richest 0.06% of families. Her proposal was every year, the richest 0.06% of families would pay a tax of 2% on the money. They have above 50 million. That tax would raise $3 trillion over a decade, just to speak to the wealth inequality in America. So think about that. You're just taking the richest 0.06% of people, making them pay 2% of the amount they have about 50 million, and that would raise almost $3 trillion over a decade.

The problem with that is that basically-- there were two problems. One is that basically, it would be unenforceable. Wealth is incredibly hard to measure. Forms of wealth are incredible to measure. Everyone would shift their wealth. Basically, there's easy parts to measure wealth, which is stocks.

There's the hardest parts of wealth to measure, like paintings and privately held businesses. And basically, it would be incredibly hard to enforce this. And once again, it would cross that boundary of the juice not being worth the squeeze, that the effort we'd have to do to enforce this and the uproar it would cause would not be worth the revenues we'd raise.

And so basically, the question is, does it raise revenue? And actually, there's now a large literature that I've contributed to on wealth taxes in other countries. I studied Switzerland, which has the world's largest wealth tax. And the evidence is that basically, wealth taxes do raise money, in the sense that people can't avoid them. But people are still pretty good at avoiding them.

And so if you think about the Laffer curve, we're still on the right side of the Laffer curve. They do raise money, but we're still pretty-- we're almost at the top, in the sense that people are pretty good at avoiding them. So basically, wealth taxes won't raise nearly the $3 trillion Elizabeth Warren estimated. It wouldn't have raised nearly that much. But even at half that-- let's say she was wrong and it only raised half as much. $1.5 trillion over decades is a lot of money to raise off the 0.06% richest families in America.

So there's a lot of interesting arguments. Thinking about this also legally, apparently, it's not clear it's constitutional. That's a whole separate issue I'm not prepared to weigh in on. But basically, the wealth tax is certainly something that will not go away.

According to the latest estimates, 20% of households-- I'm sorry, 20% of all wealth in America-- America is a 360-million-person country. 20% of all the wealth is held by 250,000 people. Hold 20% of the wealth-- and yet their effective tax rates are lower than the average tax rate in America.

So the 250,000 people who hold 20% of all the wealth in America, because of things like capital gains exemptions, step up in basis at death, and other ways to avoid estate taxation, they actually pay less in tax than, say, I do as a professor or a middle class worker would pay. So basically, this debate is not going to go away. Yeah?

AUDIENCE: That's a portion of their income or their wealth or--

PROFESSOR: Great question. When this is measured, they measure it as their effective wealth flow. Their income is very low because they just are building up this huge stock of wealth. So what they say is, where these calculations are done is they say, look, take your wealth. Effectively, what's your flow on that? We can't measure it because it's all privately-held businesses.

We can measure what's the effective flow. And then we can say, how much are you paying in tax compared to that effective flow? And the answer is very low.

AUDIENCE: Flow as in the appreciation?

PROFESSOR: The appreciation of those assets. So in other words, imagine that your capital gains were taxed on accrual. So the accrual of your wealth, even if it's not realized, we're going to measure how much you're paying a tax rate to the accrual. And it's tiny. It's tiny when measured in that basis. Yeah?

AUDIENCE: Politically, if we wanted to change that, if we wanted to get their effective tax rate up, would that be difficult? Because do you foresee that group of people has a lot of political power or ties to people with political power?

PROFESSOR: This is, in some sense, the vicious cycle of wealth concentration, which is that wealth gets very concentrated, that leads to political power, which makes it harder to take on issues, which makes it harder to take on those progressivity issues. And that is a concern. It's a large concern, I think.

We have, in the past, raised taxes on the wealthy, most notably to fund the Affordable Care Act. We put in a large new tax on the highest-income Americans. That wasn't that long ago. But nonetheless, I believe it's a challenge that faces us. And the question is, how we're going to deal with a society, with one where increasing shares of wealth are concentrated in fewer people who are paying lower and lower tax rates on that?

So the last thing I want to talk in chapter 23 is the other form of wealth tax we have is property taxation, largely on houses. So we also tax-- we don't just-- we don't tax-- currently, there's no tax, really, on a stock because we don't have a wealth tax other than property taxes. Property taxes largely go to states and localities, mostly localities. They're the majority of the tax revenue earned by localities. And the vast majority is on housing.

Now how do property taxes and houses work? Let's be clear. It's a tax on the assessed value of the house. What that means is there's some tax assessor who comes by and says, based on all the characteristics of your house, this is what your house is worth. And we will tax you based on that assessment.

However, that is as much art as science in many cases. And it can lead to a lot of variation. So for example, if you take the assessment ratio-- if you take the assessed value of houses in Columbia, South Carolina, to their market value, it's 4%. So assessors assessed the value at 4% of the market value because they haven't done it forever, and they tend to maybe go too low. Whereas if you look at Providence, Rhode Island, it's 100%. Nationwide, it's about a 50%, 57% ratio of assessment to property value. So basically, that's one challenge.

And in particularly, there's a racial imbalance component, which is quite interesting actually. Research found that the assessment rate is higher in minority neighborhoods because heavily minority neighborhoods tend to have lower property values. And the assessors don't account for that. So actually, the assessment ratio is a higher facing minorities, which is quite interesting.

So this is a big issue. There's a lot in the book on this. It's getting towards the end of semester, so I'm just going to focus on two issues.

The first issue is property tax incentives to businesses. Not only individuals pay property taxes, but businesses pay property taxes. And the big debate in state and local public finance is using property tax breaks to try to attract businesses, OK? This is a common tactic.

Indeed, more than about $50 billion every year is given away in tax breaks to companies by localities to try to get them to move there. So for example, Foxconn is a maker of flat screen TVs and other things. They were considering a new plant in January 2017 in the US.

There were bids put in and, eventually, Foxconn agreed to set up a $10 billion plant in Wisconsin in return for about $5 billion in tax breaks. The evidence was that the state itself estimated that even if Foxconn are the most ambitious estimates of their proposal, it would take until 2043 for the state to recoup the investment it made.

And I think Foxconn, in end, has backed out of it. I haven't updated this. But this is not uncommon the state uses tax breaks.

Now, this raises two interesting questions. and sometimes it's less important to a specific thing than it helps you think about tax breaks. The first question is, is this a good idea for Wisconsin? What two factors will determine whether it's a good idea for Wisconsin to give a tax break to a business to move there?

What are the two things that determine that? I'll give credit for either one. What are two things to determine whether it makes sense for Wisconsin to have a tax break for a company to move there? Yeah?

AUDIENCE: Revenue and tax revenue.

PROFESSOR: Well, it'll be, basically, let's call it the social value for the state. You could define it just as tax revenue. If you think you care about your residents having jobs, it could be more than just tax revenue.

But one factor is the social value delivered by that plant being in Wisconsin. That's one part of the equation. What's the other part?

AUDIENCE: [INAUDIBLE]

PROFESSOR: No, that'll be part of your social value calculation. What's the other thing? Yeah?

AUDIENCE: The opportunity cost of that revenue?

PROFESSOR: Well the opportunity cost would be in the social cost. So social cost would be net of opportunity cost. But the opportunity cost relates to the answer I'm looking for, which is what determines the effectiveness of tax breaks?

AUDIENCE: [INAUDIBLE]

PROFESSOR: You guys know this. Yeah?

AUDIENCE: The [INAUDIBLE]

PROFESSOR: The elasticity of movement. To what extent are firms actually going to move. So let's have a big tax break. Remember, anytime I give a tax break, two things are happening.

I'm giving away money to companies that would have been there anyway. For Wisconsin's perspective, that's a total waste. That's just costing the opportunity cost that money, and I'm inducing firms to move there.

So Wisconsin's perspective, it's the product of how elastic our movement decision times how valuable is it for them to move into Wisconsin, accounting for government costs, accounting for environmental, et cetera. It's the product of those two, very important to keep in mind.

The best estimates are, roughly speaking, it's about worth it, that basically there are large social benefits. In particular, there's large positive externalities from manufacturing plants to move to a place, when manufacturing plants move to a place and increase the productivity of everyone around them.

So there are large spillover benefits to getting a plant to move there. However, the elasticity is much less than 1. And so when you multiply the two together, you get that, roughly speaking, from Wisconsin perspective, it's roughly a break even.

Depends how you do the social benefits. Maybe it's a little good, a little bad, but basically essentially two things counteract each other, OK? People understand that? Yeah?

AUDIENCE: The elasticity of the business?

PROFESSOR: The elasticity of the business decision to move to Wisconsin as opposed to somewhere else.

AUDIENCE: OK.

PROFESSOR: Because I'm paying to get them to move-- I'm going to say to Foxconn, I'll give you $5 billion in tax breaks. To what extent does that cause Foxconn to move to Wisconsin? That's the key thing.

AUDIENCE: How's that measured?

PROFESSOR: How's that elasticity measured? So you basically look at when states give tax breaks, you look at where firms locate. So essentially, you do what's called a spatial equilibrium model, where, essentially, you look at when a firm puts up to bid, which tax breaks each place give. And where does it end up as a function of those relative tax breaks. Does that make sense?

Now here's the next question. We've just done Wisconsin analysis. From the US perspective, how do we think about this a good deal or not? Yeah?

AUDIENCE: It's a bad deal because the firm's probably going to be in the US.

PROFESSOR: It's definitionally a bad deal. Because if Wisconsin and New Mexico are fighting, yes, it's true, they may be fighting against Taiwan, but the extra Wisconsin pays over New Mexico is pure waste. Because we don't care if it's in New Mexico or Wisconsin as a nation.

So it's unambiguously a bad idea from a national perspective to have these states competing. It may be or may not be a good idea for the states, probably roughly neutral. But it's obviously bad for the country because the benefits-- the countries have, regardless of where the plant locates.

Once again, I care less about the example and more about how you think about tax breaks. You're going to read-- especially in this new administration-- you're going to read about tax breaks every day in the newspaper. And you always want to think about them this way. Think about the marginal and [INAUDIBLE] effects of those tax breaks.

Now that's the first thing I want to cover. The second thing I want to cover is kind of interesting, which is that, remember, what's the ultimate inelastic factor? It's land. We economists love taxing land because there's no deadweight loss.

And the truth is, landowners generally tend to be richer than non-landowners, so it seems like a great tax. It's fairly progressive and no deadweight loss. The problem is, we don't tax land. We tax homes on that land. And homes are elastic.

So the problem is property taxes are distortionary because they don't tax the value of the land. They tax the value of the whole property, which includes the house. So a famous idea dating the philosopher Henry George is, why not just have a land tax? Why not just tax the land itself?

Indeed, there's some success stories of this approach. Pittsburgh, in the 1940s and 1950s, had a bunch of properties that were sitting on-- they had a bunch of properties that were assessed as fairly high value, but were on land that was basically not that valuable. Pittsburgh said, we're just going to assess the land.

People were like, wow, it's really cheap to move to Pittsburgh. Property taxes are low. They moved there and didn't have this distortionary effect. So this is an idea that's very appealing to people, sort of Georgian taxation of just tax the land.

The problem is, this is a great example of egg-headed economists and things that work well in theory, not in practice, which, it's incredibly hard to value land. Because we don't sell land. We sell the land plus the house.

So the problem is, you can imagine, it's hard enough to assess what a house is worth. To assess the value of just the land part of the house is incredibly hard. Just to give you an idea, I had a special mortgage at MIT that had to get paid off. I had people come assess my-- it's a fairly rare old property in Lexington.

I had two assessors. There was a 50% variance in what they said my house was worth. There's a lot of art here. Then you add on top of that, well, you got to me how much of that's the land. It gets incredibly hard.

So these land taxes never end up getting used. It's just an interesting theoretical concept that that's what you'd ideally like to do. So that's all I really want to say about property taxes. Once again, like everything else in this course, there's millions of other fascinating aspects that we don't have time to cover.

But I do want to have time, since many of you have been going out in the business world when this is all over, I do want to have time to go carefully through chapter 24 and the taxation of corporate income. This is, quite frankly, perhaps the most important chapter we teach for the foreseeable future, this and the next chapter, because of the giant debate over taxation that's about to happen.

Because in 2017, we saw the largest corporate tax reduction, probably, in our nation's history in terms of dollars. Was it TCJA? The Tax Cuts and Jobs Act-- you got to love the names of these laws-- of 2017-- it was the largest overhaul in corporate taxation in 30 years.

And part of the reason was legit, which is the US corporate tax rate was well out of line with other countries with which we compete for countries. So the average developed country which would compete had a corporate tax rate of 24%. We had a corporate tax rate of 35%.

And the view that was first international competition, et cetera, and so there was a large corporate tax cut down from 35% to 21% of the corporate tax rate. So what I want to talk about is, why do we have corporate taxes? How do they work? And how do we think about evaluating a corporate tax cut? Yeah?

AUDIENCE: How did the US end up in a position where it had such a higher corporate tax rate than other countries to begin with?

PROFESSOR: I don't know. That's a good question. I mean, one fascinating thing about-- people always talk about high tax Europe. But in fact, Europe, in general, has higher labor taxes and lower capital taxes that the US, which is interesting. You think of it as a progressive country but, in fact, actually, capital tax in Europe are often quite lower than the US.

So let's talk about, what are corporations? What are corporations? Corporations are essentially-- they're modes of production, but you can produce things in corporations or non-corporate entities. There's two key sectors.

There's the non-corporate sector. That would be things like individuals, so individuals providing services or partnerships providing services. Then there's a corporate sector. And the big difference in the corporate sector and a non-corporate sector is limited liability.

Limited liability means once I incorporate, I'm only liable for the value of that corporation. So if I'm running my company as a non-incorporated company, and I something bad, they could sue me for all my personal wealth. Once I've incorporated, I'm only liable for the value of that company itself, so that's a big plus, as you can imagine.

The fundamental feature of corporations is a separation between ownership and control. The fundamental feature-- do you have a question? The fundamental feature is a separation between ownership and control. That the people who own the firm, who own the stock in the firm, may not be the people who actually run the firm.

Now this leads to a common problem that we call the agency problem. You may have learned about it in other classes. We talked about a little bit in 1401-- which is a misalignment of incentives between the owners and managers of a company.

So the example I use in 1401 that I like is let's say I'm a CEO of some company. I'm managing it. And I manage this company. And the company is pretty big, but not really big enough to justify my own corporate jet. But all my friends have corporate jets, and I'm really jealous.

I feel I'm like the left-out kid because they have their corporate jets. So I want a corporate jet, but I can't really justify it. So what do I do? It's not profit maximizing. So if I was the owner, I wouldn't have a corporate jet. But I'm not the owner. I'm the manager.

So what I do? I make a fancy PowerPoint slide, and I cook the numbers so it looks like the company will save money if I have a corporate jet. I present it to the owners. They're like, well, that sounds good to me. And they gave me a corporate jet. And the company makes less money.

That is a classic example of a misalignment between managers who want to lead good lives and want the company to do well. But basically, fundamentally, they're about themselves and the owners who are just about the profitability of the company. And that can lead to things like outrageous CEO compensation and other issues. So that's what a corporation is.

How are they financed? Well, let's look at figure 24.1-- talks about how firms finance investments. How do firms finance their investments? Well, let's say a firm wants to finance an investment. It needs money. It wants to invest money. It needs money.

What does it do? Well, it can use its retained earnings. It can say, I've got a bunch of money around. That's the bottom first arrow. We're going to ignore that for now.

Let's say it doesn't have enough retained earnings around. It needs to raise money. So it can raise money in two ways. It can issue bonds or stocks.

So what's the difference? Bonds or what's called debt finance are literally loans where you agree to a fixed term of payment. You say, I'll pay you back this interest rate for this period of time, OK? And if I don't, I'm in default.

Stocks are essentially a share of the company, where the only promise you're giving is that these people own shares of the company. You don't owe them any other money. You don't ever have to pay them anything. It's just they own a share of the company.

Now when you own stock, then why would people buy stock? Well, they can be rewarded in two ways. One is they can get dividends, which are periodic payments that companies make to their shareholders. And the other is they can accrue capital gains, which is stock goes up in value. I can sell it and make money.

So we're going to come back to this, but that's the basic structure of firm financing. I lay this out now-- we'll come back to it next time, but I'll lay this out now to highlight the question of, why do we have a corporate tax at all? Why do have a corporate tax at all?

Well, there's really two reasons. The first reason is that, in fact, the optimal tax is a pure profits tax. A pure profits tax is a terrific tax. Why is a pure profits tax a terrific tax? For a simple reason, max pi gives the same answer as max 1 minus tau times pi.

Pure profit taxes are not distortionary. Whatever I'm going to do to maximize my profits, I'm going to maximize 1 minus tau times my profits. There's no distortion. So a pure profit tax is a great tax.

You're taxing profits, which are generally held by the wealthy, and you're not distorting behavior. Because whatever they did to make as much money as possible, they're still going to do it afterwards. So that's one argument for corporate taxes.

The problem with this argument is we don't measure pure profits. We measure reported profits, which go through a series of exercises. We'll discuss some-- but are incredibly complicated and detailed concept, which do involve choices that you can change. You will distort your behavior when there's taxation. And we'll talk about how that happens.

So unfortunately, we don't have a pure profit tax. We don't tax economic profits. We tax accounting profits. And accounting profits are very different than economic profits. And so as a result, taxes can be distortionary, so this pure argument doesn't quite hold.

The second reason is more interesting is that, basically, is the inside build-up argument we talked about then we talked about savings incentives, which is companies can always retain their earnings. I can make money and hold on to it.

And absent a corporate tax, if I never pay it out, I never get taxed on it. So let's say I have a company that makes money and for 100 years, just sits on it. That means 100 years, they're not paying taxes on what they've earned. By the time they do, the [INAUDIBLE] value is essentially 0. You essentially have allowed them to escape taxation.

So the idea of a corporate tax is the idea of why we'd like an accrual tax on capital gains. That basically we want to capture along the way what they're making. Unlike with capital gains, we actually have a measure of what they're making, which is their profits.

So while it'd be hard to have an accrual tax for capital gains, it's not hard to have a corporate tax. We just tax their profits. And that way, they don't just infinitely build up a stock of assets.

So how does the corporate tax work? Well, it's very simple. The corporate tax is the corporate tax revenue is equal to the tax rate, tau, times revenues minus expenses minus any tax credits.

So let's talk about the three elements of this formula. Let's talk about revenues. That's easy. It's what the firm makes. There's some controversy in measuring it, but not a lot. A lot of the controversy in taxation comes-- there's not a lot there.

The big controversy in taxation is expenses, which is what the firm pay to make those revenues? Now this consists critically of three components. The first are your cash flow costs, like the wages you pay. Those are pretty easy to measure. So cash flow costs are pretty easy to measure.

The second is interest payments. We call an interest payment you make an expense. And those are also pretty easy to measure. They're measured by when you have a bond that's public, what you're paying in interest. So cash flow is easy to measure and interest is easy to measure.

The harder part to measure is what we call depreciation, which is the fact that your capital assets are getting less valuable over time. And that is a economic loss to you, that your capital assets are getting less valuable over time. It's an economic loss to you.

When you hire a worker, when I hire Valerie for a year, I'm paying her a wage, effectively renting Valerie for the year. But when I buy a building, I'm not renting it. I'm buying it. And that building gets crummier over time. And I got to fix it.

That is a loss to me. Just renting the building. Think of it this way, if I was renting the building, I deduct from my taxes every year's rent. The fact I'm buying it doesn't mean it's suddenly no expense. The expense is the depreciation of the value of that building over time. The problem is-- yeah?

AUDIENCE: Is there depreciation as well as the money that you pay to fix the building as an expense?

PROFESSOR: So let's talk about the general concept, what is economic depreciation? Economic depreciation writ large is the drop in the value of the asset each year. So if I buy an asset for $100,000, and one year later, I sell it for $90,000 without putting a penny into it, then that is a $10,000 depreciation. That is a technically correct measure of depreciation.

Literally, if we could measure the value of every good every year, depreciation would be the change in the value of the good from year to year. That's technically correct. The problem is, we can't do that.

Just like we can't tax capital gains and accruals, it's pretty hard to measure these things year over year. So what we do instead is we have engineering approximations to depreciation. We have what's called depreciation schedules.

There's a monster book which for all classes, all assets in America lists the rate at which we've estimated the depreciate. And you can then take that off of your taxes. Now how do you do that?

Well, there's multiple ways to do it. The typical way would be you would basically say, look-- so let's take a simple example. $100,000 building, it's going to depreciate not 10% a year but $100,000 a year because percents are tricky, right?

Let's say it's going to depreciate $10,000 a year. It's a weird schedule, but just make the math easier. Then, basically, say every year, you deduct $10,000 from your taxes. Now that is one schedule.

However, in some times, the government want to incentivize people to invest. And one way to do it is by offering accelerated depreciation. How does accelerated depreciation work? It means you can depreciate faster than the estimated life.

So you would say you could deduct $20,000 a year for five years. Why is that more valuable? Because of net present value. Remember, pushing taxes off is good. So by depreciating more upfront, you push taxes off, OK?

So the more you can depreciate upfront, the more value it is net present value. Think of depreciation as a gift from the government. Think of it someone's going to buy the asset anyway, come along and, by the way, here's a gift for you of depreciation allowance. Well, the sooner that depreciation allowance comes, the more valuable it is to me.

Indeed, in the limit, you can allow what's called expensing. Expensing is you can literally deduct the entire cost of the purchase the year you purchase it. It's super depreciation, where literally it's deduction. That's called expensing investment. So the key thing is that, basically, the more rapidly you allow depreciation, the more valuable it is.

Now the trick, of course, is these schedules are very hard to measure. In fact, there's a really novel study because there's actually one market in which it's pretty easy to measure real depreciation, which is the market for PCs. Because people are always selling PCs at different vintages all the time. So you can actually measure economic depreciation.

And this study, economic depreciation of PCs, found the interesting thing, was the depreciation is exponential not linear. Every year you hold a PC, it drops by 50% of its previous year's value. There's exponential depreciation. Every year is 50%.

So essentially by the fifth year, PCs are worthless. Now you might think, gee, my PC kind of holds up pretty well. Why is there a 50% depreciation? Let's say you treat your PC pristinely, why is 50% depreciation? Yeah?

AUDIENCE: Because better technology--

PROFESSOR: Because better technology is coming along at low prices. So essentially, one year later, you can get a much better PC for the same price. Therefore, effectively, your PC is depreciated.

That's the key thing. It's not just physical breakdown. It's the value. So you get a much better PC for the same price. Your PC is essentially worth less.

There's a second issue, which is new software comes along that won't run on your old PC, which appreciates it further. So this is not physically breaking down. It's software-wise breaking down because it can't run all the new software that's coming along. Yeah?

AUDIENCE: So if I buy a PC in the first year, I can deduct that as an expense. And then as that PC depreciates, I can also--

PROFESSOR: No, it depends on the depreciation schedule. But if the depreciation schedule was this one, it's 50% exponential, we'd say, if you buy $1,000 PC at the beginning of the year, you can deduct $500 this year, $250 next year, $125 the year after, et cetera.

You have to deduct the value of the depreciation. Only if there's expensing we deduct the whole thing this year. You deduct the depreciation, which is 50% of the previous year's value. Yeah?

AUDIENCE: Why would the government allow for expensing outside of a macro?

PROFESSOR: The main reason for expensing is to encourage investment, is basically as an investment encouragement. And we'll come back to why that might make sense later actually,

AUDIENCE: Wages are [INAUDIBLE].

PROFESSOR: Well, wages are a cash flow. Everything you pay every year just gets deducted. The thing is, investments are different. You don't deduct the investment as expenses because you depreciate the investment.

Now with the corporate tax, I want to talk about two things. The first is incidence. And we've covered this already, which is, what is the incidence of the corporate tax? Well that depends on the relative elasticities of the factors that are subject to that corporate tax. Go back to chapter 19.

Well, a corporation is not a thing. A corporation is an agglomeration of factors. Think of them as labor and capital. So the corporate tax is a tax on those two factors. Well, who will bear that tax depends on what's most elastic and inelastic, remember?

Well, labor, if you think about a tax on the US corporate sector, labor is going to be pretty inelastic, not perfectly inelastic. Because remember, we also produce things in America through a non-corporate sector.

So there is some potential for elasticity. I can move to the non-corporate sector, which is just self-employment and things like that, but it would be pretty inelastic. So we think in the short run, most of a corporate tax will be borne by laborers.

On the other hand, capital is super mobile. Actually, no, I'm getting this backwards. Hold on one second. Let me back up. I got this backwards.

Labor is somewhat inelastic because it can move across sectors. Capital, in the short run, is totally inelastic. You've already invested in the corporate sector. You've already made that investment, right? You've invested in GM. There's nothing you can do about that. It's inelastic.

Labor is somewhat elastic, so it'll be shared between capital and labor. Over time, we think labor will necessarily get more elastic over time, maybe a little bit, as people reorganize production society towards the non-corporate sector. But capital will be very elastic over time. Over time, capital can easily flee.

So over time, we think of, in the long run, the incidence of corporate taxes could be a lot on workers, not a lot on capital. However, once we get to general equilibrium tax, incidence gets complicated. Because when that capital flees, where does it go? It goes to the non-corporate sector.

What happens when capital flees to the non-corporate sector? Supply of capital goes up, so the return to capital goes down. So actually, the incidence of taxation is going to be somewhat on capital. It'll be on, in particular, overall capital will suffer.

And in particular-- this is a very important point-- when you tax corporations, capitalists in the non-corporate sector suffer. Why? Because capital flees the corporate sector to the non-corporate sector. More capital in the non-corporate sector raises or lowers the rate of return to capital. So through general equilibrium tax incidence, there's taxation on the non-corporate sector.

So in the long run, we think that the incidence of taxation will be shared to some extent by workers, by corporate capital, by non-corporate capital. And we're not really sure what proportions. And that's why we love empirically-- yeah?

AUDIENCE: Sorry. Just to make sure I understand what you're saying. You're saying that when you tax corporations, it harms the non-corporate sector?

PROFESSOR: Yeah.

AUDIENCE: Self-employed people?

PROFESSOR: Yeah. Because, basically, think of it as self-employed people need to raise money to buy their equipment. Not self-employed people, people who invest in those self-employed people.

So in other words, I'm a guy who loans money to dentists to build office buildings. And I can charge the dentist this high rate of interest because not many people want to loan money to dentists. Suddenly, all this capital comes flooding in from the corporate sector. And they're like, we'll loan you the lower rate of interest.

That hurts me as the guy who loaned to dentists. So the capital in the non-corporate sector will see a fall in its rate of return through the increase in supply. Yeah?

AUDIENCE: What about capital fleeing to different countries?

PROFESSOR: Then there's the other thing, which is capital can flee to different countries. So basically, in theory-- once again, general equilibrium incidence is tricky. In theory, if you're a big enough country, you could affect the worldwide rate of return to capital.

Small country, you would think that it should all just flee. In practice, it doesn't. In practice, capital is surprisingly sticky. So in practice, there's striking immobility of capital across countries.

So almost everyone in every country in the world holds a much too big share of their portfolio in their home country. It's a universal factor that investors in every country around the world almost always, from an optimal portfolio theory, hold too much of their capital in their home country.

AUDIENCE: It seems to make sense for America, for big country--

PROFESSOR: But small countries, people in-- I don't know, in Israel hold too much money in Israel. People in Thailand hold too much money in Thailand-- it's bigger-- hold too much money in Thailand. So basically, capital is not as mobile internationally.

Now, there could be an optimality of this, which is maybe I know my investment opportunity is better in my local country. So there's an optimal reason all my capital there. So it's not necessarily a huge mystery, but there's not as much international flows as you'd think.

But the bottom line is, it's a very complicated. I mean, your head is spinning at this point. That's the bottom line. It's very complicated.

Workers are getting hit. Corporate capital is getting hit. It has to leave. Non-corporate capital is getting hit. Maybe international capital is getting hit. It's very complicated. So that's why we have empirical economics.

What's the bottom line? The bottom line is that the best estimates are that for every dollar in tax cuts, about half gets borne by capitalists and half gets borne by workers. I would say that's the best estimates. There's some range.

It's certainly not what most people assume, which is a corporate tax cut is just going to benefit capitalists. That's not true. A corporate tax cut will benefit workers.

And that was a large selling point of the Trump tax cut. That would raise wages through this-- he didn't teach my model-- but basically, through this idea that corporations will benefit, and they'll pay their workers more. And that's not a crazy theory. And in fact, the evidence is about a 50% incidence on workers.

So what's the fairness effect? Well, it's a corporate tax cut is less fair than an individual tax cut, which is borne all by workers. Because remember, the supply is fairly inelastic. So if you cut individual taxes, workers are going to benefit from all of that. But it's not as regressive as you might think because some of it is borne by workers.

Now that's the equity part. What about the efficiency part? Remember, we don't have a pure profits tax. As a result, if we tax corporations, it will impact their economic decisions.

And now we come to maybe what is the hardest model of the semester. So here we are, the last full week. And we'll go through a very hard model. This is the effect of how corporate taxes impact corporate investment.

So I'm going to go through this slowly, but please stop me and ask questions. We'll get through this before the end of class.

Think about a firm making an investment decision. That firm is going to invest $1. And for every dollar of investment-- for every $1 of investment, they're going to get MP sub k of return, the marginal product of capital.

So in other words, the marginal product of capital is 0.1. That says for every dollar I invest, every year, I get $0.10 back. That's the marginal rate of return to that investment, the marginal product of capital.

Now, let's also say that every period, that investment depreciates by some amount delta. Two things are going on. I'm investing. I'm making MPK, but the value of my investment is falling by delta.

I'm assuming delta is linear. You can imagine it's non-linear, but let's just assume it's linear to make life easy. Assume delta is linear. MPK is not necessarily linear.

Now third factor, the firm, if they want to make an investment, has to finance it. Forget retained earnings. They have to finance it. Let's imagine the firm finances it by borrowing money. And the rate of return is rho. That's the rate of return they have to pay.

There's multiple channels. Let's just summarize them as saying, roughly speaking, through all the channels firms use, the cost of financing, of borrowing $1, of getting $1 to invest is rho. It could be from a bank. It could be through stocks. Whatever it is, it's rho.

So what that means is that every year, firms pay out delta plus rho in costs for every dollar of investment they make. They're paying the interest back. I'll call it interest, but it's just a summary of the cost of capital. And they're paying depreciation.

That is the cost of paying it every year on this investment they make. And they're getting MPK. They're getting MP sub k.

So to think about this, let's assume delta equals rho equals 0.1. Delta equals 0.1. Rho equals 0.1, 10%. Let's just make life easy. So now let's go to figure 24.2. Let's draw this.

So what we have is on the x-axis is investment, k. On the x, investment k. On the y-axis is dollars. The y-axis is dollars. And we have a line at $0.20, 0.2.

This is delta plus rho, which equals the marginal cost. We'll call it MC1, the marginal cost of investment. Every period, that's what you have to pay.

We're assuming it's linear. It doesn't have to be linear, but assuming it's linear. That for whenever you invest $1, you're paying $0.20 every period to invest that dollar.

What is the benefit investment? Well, it's some marginal product of capital MPK, which equals the marginal benefit. MPK is downward sloping. Why? Someone tell me. Yeah?

AUDIENCE: You depreciate.

PROFESSOR: No, depreciation is here. Why is MPK downward sloping?

AUDIENCE: [INAUDIBLE]

PROFESSOR: Well, no, because the more you invest, the less productive it is. We have diminishing marginal products in production, just like we have this. Going back to your old-school 1401, lecture 5.

Just like with diminishing marginal utility of consumption, we have diminishing marginal product of production. So marginal product of labor diminishes. The marginal product of capital diminishes over the relevant rate.

There may be ranges where it goes up. But we think in the relevant range for production, we think there's decreasing returns to scale. We think in the relevant range of production, there's a diminishing marginal product of capital. Otherwise, you just grow forever.

Without diminishing marginal product of capital, we'd have one firm running the economy. Now maybe we do, but the bottom line is we think in the relevant range of marginal product of capital is diminishing. This is very important. It's just like marginal utility of consumption and tuition. Each additional dollar of capital is less productive than the previous one.

Now, what does that mean? That means that the optimal level of investment is at this intersection. And we're going to call this K1. Think about the intuition here. If the marginal product of capital is above $0.20, then you're making money. You should keep investing.

What happens when you keep investing? You move down this line. If the marginal product of capital is below $0.20, you are losing money. So you should invest less. You move up here, and that's the optimal point.

So the optimal point is where the return to the next dollar of investment is equal to the cost of that dollar of investment.

Now let's complicate things. Now let's add taxation. What does taxation do? Let's just say there's a pure corporate tax, nothing fancy, just a pure, I'm going to tax your income. I'm going to tax your income.

Well, what that does is that means that instead of taking home MP sub K, you take home MP sub k times 1 minus-- what am I calling it-- 1 minus tau, where tau is the corporate tax rate. What does that do to this graph? That shifts in the marginal benefit curve.

Now the marginal benefit curve is MPK times 1 minus tau. That equals MB2. It shifts in the marginal benefit curve.

What does that do to the optimal level of investment? It lowers it. It lowers the optimal level of investment to K2. Why? Because since the next dollar is going to yield less, you don't want to invest as many dollars because each dollar investing is less and less productive.

So an investment that was productive here-- this investment was productive before tax because MPK exceeded delta plus rho-- is no longer productive after tax because MP times 1 minus tau is below rho plus delta. Questions about that? Once again, stop me if this isn't clear. It's only going to get harder.

So the bottom line is, once again, your key intuition is diminishing marginal product of capital. And that's going to say corporate tax will lower the level of investment. Now, here's where it gets tricky, which is corporate taxation does not just impact MPK because of depreciation.

When there's depreciation allowances, the higher corporate tax rate means a higher value depreciation allowances. In particular, when we buy an asset, think of buying an asset as it comes-- you know those refrigerators that have the energy facts on them? Think about that as any asset you buy comes with a coupon that says, here's the value of depreciation allowances with this asset.

So if it's pure economic depreciation, the value is 0. Because, basically, truly, you're just getting back from the government what it's actually depreciating. But if it's better than economic depreciation, it's a positive value. So basically, z-- I'm sorry. Scratch the 0. Let me back up.

It's simply not 0. Let me redefine it differently. It's the NPV of the depreciation relative to the purchase price. So we're going to call z, to make life easy, z is between 0 and 1. 0 would be you don't get depreciated at all. 1 would be expensing. You depreciate it today.

In between, it's depreciation that happens over time, but the slower you get it, the less it's worth. So depreciation, which says, I'll let you appreciate this over 100 years is worth not very much to you. Because by five or six years from now, that's not worth a lot. And you've still got 95 years to go.

Depreciation, which says you can appreciate over three years is worth more to you. So the more rapid is the depreciation, the higher is z. If I literally let you deduct it today, which we call expensing, z is 1.

So what that means, with that concept z, what that means is that this is, essentially, something you get. We say you get to deduct from your taxes z. For every dollar you invest, you get z.

You get a tax break that's worth tau z to you because it's deduction, not a credit. So you get a tax break of tau z. For every dollar you invest, you're going to get tau z tax break because you're going to deduct z at a corporate tax rate of tau.

So what does that mean? That means that, basically, for example, if the depreciation allowance is worth 50%, if z is 0.5 and the tax rate is 20%, then that's 10% off price. Think of it that way.

I was going to buy this building for $100,000. The value of depreciation allowance is 0.5 and present value. The tax rate is 20%, so I'm going to get to deduct 10% of the value of this. So it's essentially $10,000 off, the price of buying it. Let me stop there. Questions about that? Yeah?

AUDIENCE: I'm still confused on what the difference is between z and the depreciation of 0.1.

PROFESSOR: Oh, totally different thing. Oh, actually not different. Great point. In a perfect world, z would be delta. It's a great question actually. In a world of economic depreciation, z equals delta.

So z is what the schedule gives you, which is different than delta because we can't really measure economic depreciation. If we measure economic depreciation, z would be delta.

AUDIENCE: OK. So that's why you do the tau z instead of the tau--

PROFESSOR: Well, no, go back to this formula. The reason I do the tau is because inside this equation, it's part of expenses. It's a deduction. Remember, we did chapter 18. Deductions are only worth as high as your tax-- with a tax rate of 0, deductions worthless.

So deduction of $1,000 is only worth your tax rate times $1,000. That's why I multiply by tau But it's a great question. Z should be delta in a perfect world. We're saying z is something else.

So now what does that mean? That means that, basically, now your cost is delta plus rho. So every dollar of investment is costing you delta plus rho. but you can, basically, offset against that cost delta plus rho times 1 minus tau z, is basically your net cost of investing.

So basically, if you're getting 10% back, you're only paying 90% as much as if you were before. So that is essentially your net cost of investing.

Now there's one extra complication. There's one extra complication, which is we also have something called an investment tax credit, which I actually forgot to mention before. We have these tax credits here in part of this equation.

What's the investment tax credit? Remember, credits are after your tax bill is computed. It's literally money the government gives you back for every dollar you invest. So an investment tax credit of 10% is literally for every dollar you invest, I'm going to send you a check for $0.10, so it's a credit.

So that means that your net cost of investment is really delta plus rho times 1 minus tau z minus alpha. Alpha is the investment tax credit rate. Call it 10%. So what does that mean?

If you go to figure 24.4, what that means is that the cost has fallen. Your marginal cost is no longer delta plus rho. It's this more complicated delta plus rho times 1 minus tau times z minus alpha.

So basically, what that's doing is, essentially-- I'm sorry. The alpha is inside the parentheses. I'm sorry. What that's doing is that's saying that tax systems, they lower the return to the activity, but they also lower the cost of the activity. They lower the return to investment, but they also lower the cost of investment

Lower the return investment, but they also lower the cost of investment. And so the net effect, K3, is below K1 but higher than K2. So taxes deter investment. The bottom line is, taxes deter investment. But how much it does so depends on things like depreciation allowances and the investment tax credit.

How do we put this together? The way we put this together is the following. We say, look, we know what the corporate tax rate is, 21%. But that's irrelevant. What's relevant is, how does taxation change your incentive to invest? Well, that's a function of both the rate and things like depreciation allowances and investment tax credits.

So what we say is we calculate an effective tax rate-- we calculate something called the effective tax rate, which is the marginal product of capital after tax minus the marginal product of capital before tax over the marginal product of capital after tax.

Ignore the denominator. Pay attention to the numerator for a minute. The effective tax rate is-- think of it this way. This is the key intuition. What is the wedge between what you get from $1 of investment due to taxes? What is the wedge between what you get for $1 investment due to taxes?

If the tax rate is 0, the effective tax rate is 0. If the tax rate was 100%, and z was 0, and alpha was 0, then the factor tax rate would be 100%. So let's think of it this way.

Imagine a world where z is 1, where depreciation allowance-- where z is 1, where you deduct the entire cost of your investment from your taxes. Can anyone give me an intuition what the effective tax rate would be then, if z was 1?

So every year, I get to expense my investment. What is the effective tax rate on that investment? Well, think about the trade-off. On the one hand, I'm paying tax on return from that investment.

On the other hand, I'm deducting the cost of that investment. So in net, it's a 0 tax rate. It's essentially, all the tax I'm paying, I'm deducting at the same time. So in other words, I'm making all this money off it, but I'm getting a full tax deduction for all that investment. So at the end of the day, it's a 0 effective tax rate.

So with z equals 0, if z equals 0 and alpha equals 0, the effective tax rate equals the statutory tax rate. Then it's just like, look, at the end of the day, if it's 35% tax rate, there's a 35% reduction incentive to invest.

But if z equals 1 and alpha equals 0, then the effective tax rate is 0. Because basically, at the end of the day, I'm deducting just as much as I'm paying, all the income I'm making, I'm going to then deduct. So at the end of the day, I'm indifferent.

Now what if z equals 1 and alpha is positive? Then the net effective tax rate is negative. That is, there's a net incentive to invest from the tax code.

That is, let's say I let you fully expect your investments, and I give you an investment tax credit. Then on net, I'm actually paying you to invest. That is what the US did in 1981. We actually set up a system where for many sectors, the effective tax rate was actually negative.

And because we both allowed very rapid depreciation and investment tax credit, we actually ended up in 1981 with the system with a lot of negative effective tax rates. Why the hell did we do that? To promote investment. The idea is they want to promote investment.

And the more rapidly you allow people to depreciate and the bigger the investment tax credit, the more you promote investment. The more you take this effective tax rate to 0, the more you promote investment. Now two comments. OK, let me stop there. Questions about that or or it's hard you have to look it over. Yeah?

AUDIENCE: What was the overall consensus about [INAUDIBLE]?

PROFESSOR: Well, basically, there's a couple of reactions to that. First of all, it did promote investment. So it's true that, in particular, things like the investment tax credit and accelerated depreciation do promote investment. You're making it cheaper. Firms, when you make stuff cheaper, they do more of it. That's good.

Second, it led to an enormous amount of, actually, excess investment in tax efficient but economically inefficient investments, in things that could generate big tax breaks without generating a lot of actual revenue. And I'll come back to that in chapter 25.

But the third thing it does is raise the overarching issue that you need to keep in mind is we have this next debate over the next couple of years about the Trump tax cuts, which is to think about we have three tools that affect investment. We have tau. We have z, and we have alpha. Those are the three tools we have to effect investment.

Here's the key point. Z and alpha-- if I change z or introduce alpha, it's an incentive to invest. Going forward, investments are more valuable. If I change tau, it's an incentive to invest and a reward to all the past investments. Because income you earn is based on past investments.

Remember I talked about the prospective capital gains tax, talked about how if we cut a capital gains tax starting today, then we wouldn't reward old investments. We would only reward new investments.

Well, think about alpha in particular. Alpha is saying for every dollar you invest starting today, I'm going to give you a tax break. But if you invest in the past and are making money off that, well, you're still going to pay high taxes on that.

And it's the same with depreciation. It's saying the next thing you buy, I'm going to give you a good deal on it. But all the old stuff you bought that's generating your old MPK, you're getting taxed on that.

So the point is, if we really want to incentivize investment, tools like the investment tax credit and accelerated depreciation are a great way to incentivize investment. If we want to just reward guys who hold stock in corporations, tau is a good way to do that.

So if we think about purely the investment margin, then cutting the corporate tax rate doesn't really make sense compared to other tools we could use. Other tools would have a much bigger effect incentivizing investment. Indeed, what's quite striking is the following. The higher the corporate tax rate, the more you incentivize new investment by things like depreciation allowances because they're worth more.

So in some sense, you could imagine a system with a high corporate tax rate and a big depreciation allowance would incentivize a lot of investment, while penalizing people who held previous investments. So that's the important distinctions. Once again, this old versus new capital, new investment versus previous investments is really the critical distinction you want to be thinking about here.

There's a lot of math here. You're not held responsible for this. So you can take a deep breath. You don't have to memorize this, figure this out. We have to figure it out because it's good intellectually. It's a good intellectual exercise. You don't have to memorize it.

The key thing I want you to take away from this is that when you hear something called the corporate tax rate, that is not what you care about, the statutory. You care about the effective tax rate. The effective tax rates are much more complicated beast.

So in the US, while our statutory rate was 35% before Trump, our effective rate was 24%. So firms, on average, paid a lot less than a 35%. So basically, that's the key thing. The key thing I want you to know from all this is to realize that taxes interact with the system in complicated ways because of things like depreciation allowances.

So now last question to motivate what we're going to do next time. Last question, what we're going to do next time is then why we cut the corporate tax. Why don't just have a high corporate tax?

If we cared about US domestic investment, it seems like I've just made an argument that cutting the corporate tax is a pretty blunt instrument. Why would we do that? I'm looking to my students from around the world on this question. Why are we worried about a high corporate tax rate in the US? Yeah, in the back.

AUDIENCE: [INAUDIBLE]

PROFESSOR: Yeah. Because we're worried about the elasticity of mobility of companies, of capital. Remember, the corporate tax rate is borne at least partly by capital. And they bear it by leaving.

So the reason why we're worried about the high corporate tax rate, people say it's because it deters investment. but the truth is, if we want to encourage investment, there's more effective tools to do that. The real reason we care is because of international competition.

The reason why we care about tau is because the high tau will mean people won't want to come here because, ultimately, they won't make as much money being here. And that is really what drove a lot of the debate over the corporate tax, was essentially the issues about international competition. And that's, next time-- yeah?

AUDIENCE: Would shifting z and alpha be sufficient [INAUDIBLE]?

PROFESSOR: They would help. But in some sense, if I'm moving a company here that's not a new company, then I've got all this old capital that's going to get taxed at tau. So for a new company setting up, they'd all work equally. For new companies setting up, all they care about is the effective tax rate.

But if I'm an old company moving here, then those investments help, but I've still got to pay-- Let's say I go from paying a 10% corporate tax rate to 35% corporate tax rate on all my old investments, that's not going to be very attractive to move to America.

AUDIENCE: And they don't count as new investments [INAUDIBLE]?

PROFESSOR: But if you move the company here, you've still got the old-- well, actually, it's a great segue to the very complicated world of international tax law, which we'll dip our toes in next time, which can be an entire semester at law school, tax law.

But this is a great setup for what we're talking about next time, which is what do we do when companies that are nationally mobile? And how do we do taxation in that case? And then after that, in 15 minutes, I'll teach you everything you need to know about corporate finance. So you can skip all those course 15 courses.

So we'll do that next time. And then we're going to start on chapter 25 next time. We'll get about halfway through. And then, remember, the last lecture is Friday-- two announcements. Don't go yet. Last lecture is Friday, 12:00 to 1:30. Please be there.

It will be recorded, and it will be available. But I hope you found the interaction in class are valuable. You'll learn a lot. It'll be the last chance for us to be together, so I hope you'll show up, if at all possible.