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JONATHAN GRUBER: All right, today, we are going to move on to really we'll start the second half of the course. The first half of the course was about, essentially, following up on lecture 1 and deriving demand and supply curves.

So you now know, and have been painfully tested on, how you can come up with demand and supply curves, on how you can take the primitives of consumer preferences and the primitives of production functions and come up with demand and supply curves, how you can use those to draw a positive, as well as normative conclusions about welfare, and how that works with different kinds of market structure, be it perfect competition, monopoly, or oligopoly.

And that is the basics of consumer and producer theory. The second half of the course is essentially applications of that model to various questions that you might have raised as we were thinking through the basics. So for example, the next two lectures, three lectures will be about factor demand, factor markets.

And in particular, we're not just going to take w and r as given but ask where do w and r come from? Where does the wage rate and the rate of return on capital actually come from? We just took those as constants. So we did producer theory. I just gave them to you. But now we're going to actually derive where do we actually get the wage rate and the interest rate.

So we're going to go back, once again, to the basic model but dive more deeply. And in doing so, we're going to get introduced to two new fields of economics. One is the field of labor economics, which is the study of labor markets, and one is finance, which is the study of capital markets. So we'll learn about two exciting new areas of economics in the context of understanding factor markets.

So we're going to start by talking-- by factors, once again, we mean capital and labor. Obviously, in the real world, there are many factors of production. We're going to simplify them into two, as we've been doing so far, which is capital and labor.

The basic theory of factor demand applies to both. So I'm going to teach factor demand independently of capital and labor. Then I'm going to come back and teach labor supply and then capital supply. So factor demand, so demand for both labor and capital, it's the same model. But labor supply and capital supply are different models, so I'll teach them separately.

So where does factor demand come from? Well, let's start with labor demand, although capital demand would be symmetric. Let's start with labor demand. And let's ask for a firm deciding whether to employ the marginal unit of labor, they have to consider the costs and the benefits of that marginal unit of labor.

So what is the cost of a marginal unit of labor? Well, the cost of marginal labor, the marginal cost of a unit of labor, is the wage. That's what it costs you to have the marginal unit of labor. OK, you want to hire one more hour of labor, you've got to pay the wage for that hour.

What's the marginal benefit? Well, the marginal benefit has two components. First of all, the marginal benefit depends on the marginal product of labor. If you hire one more unit of labor, how many more goods will you produce? So the cost is the wage, the benefit to marginal product of labor. We can't stop there.

Because firms don't care about units of goods. Firms care about revenue. So the marginal benefit of hiring another unit of labor, is the product of the marginal product of labor times the marginal revenue of one more unit of good. So if I hire one more unit of labor, I get one more unit of output, and then that output itself has a marginal revenue.

So think about it this simple case, think about this in a perfectly competitive market. In a perfectly competitive market, then the marginal benefit of labor is marginal product of labor times the price. So what's another unit of labor worth? It's worth how much that worker can produce times how much I could sell it for.

So in a perfectly competitive market, the marginal benefit equals the marginal product of labor times price. So essentially what this says for the competitive market, if you set marginal benefits equal to marginal costs, you want to set the marginal product of labor times the price equal to the wage.

And that's how you decide how many workers to hire. You basically hire workers until their benefits, which is the value of what they produce, equals their cost, which is their wage. Once again, pretty straightforward when you think about it.

So basically, the value of a worker is determined by how productive that worker is or how many units she can make, times what those units sell for. Another hour of labor making computer chips, is more valuable than an hour of labor making potato chips. Because computer chips sell for more than potato chips OK. So basically, the labor you produce is more valuable if the goods sell for a higher price.

A great way to illustrate this, and I'm sorry for my pro-sports bias here, is to think about basketball players. Think about the National Basketball Association as a set of firms that are trying to deliver the best basketball products.

So you're a firm, you're a team in the NBA, and you are trying to figure out how to set your payroll to maximize profits. You're trying to decide who to hire on your team. You have 12 slots. You're trying to decide who in those 12 slots you want to hire to maximize your profits.

So what you really want, is you want to ask, well, what's the marginal product of the next player times the value of that product? Well, the marginal product is the number of wins they produce. So you want to ask how many wins will a player add to my team? And the value is how much more money I'll make per win they add, OK.

The worst basketball teams do not make as much money as the best basketball teams. So basically, by hiring a player, I'm asking how much that player increase my wins, that's their marginal product, and what's the value of a win? The price, effectively, is how much profit I'll make per additional win. And that's the marginal product of an additional basketball player.

So for example, LeBron James makes about $32 million a year. LeBron James is not actually the best player right now but over the last 20 years, the best player in basketball, some would argue the best ever. He makes about $32 million a year. It's a lot of money because his marginal product is enormous. He's a great player, and the additional wins are valuable in terms of additional advertising, attendance, et cetera.

Now, other players don't make as much. How many of you have heard of Nate Robinson? OK, good, I always like to see-- OK, mostly gender biased. I saw one woman shake her head. Hopefully, there's more. OK, sorry, sorry for the gender-biased example.

But Nate Robinson is one of the shortest players in NBA history, who's 5' 9", shorter than me, in a world where the typical player is about, 6' 6", 6' 7". So he's one of the shortest players in NBA history but an excellent player, played for a number of teams, very exciting player. But no, LeBron James, let's put it that way.

By the end of his career, he wasn't great. He made about two million a year. Not bad, we'd all take it but not LeBron James. He made about two million a year. Why did he make two million a year? Well, a win was still worth a win, but his marginal product was low. Nate Robinson contributed less to a win than did LeBron James.

Nate Robinson then quit the NBA and went to play basketball in Israel. Israel's basketball crazy. They love basketball. They have their own league. In Israel, he was a superstar. He was one of the best players. He had maybe the highest marginal product in the league. Because he was so much better than the other players over there, he could massively contribute to wins.

And his salary went down from two million to 300,000. Why? Well, his marginal product went up, but the value of a win went way down. If you add wins in the US, that's billions of dollars of advertising revenue or attendance revenue. In Israel, it's not such a big deal.

So here's an example where marginal product went up, but the benefit of hiring went down. And we call that benefit, marginal revenue product. Marginal revenue product is the marginal product times how much it's worth.

Nate Robinson in Israel, was worth less. A ticket. In Israel, the highest priced price ticket is $75. The highest price ticket in the US for a regular season game courtside for the Boston Celtics is about $2,000. OK, so basically, there just wasn't that much money to be made from basketball in Israel. So Nate Roberts had a higher marginal product. He had a lower marginal revenue product, which is why he was paid less.

So that illustrates the important distinction of marginal product and marginal revenue product. OK, questions about that. Yeah?

AUDIENCE: Wait. So it'd say, [INAUDIBLE] I mean, how do [INAUDIBLE]

JONATHAN GRUBER: Well, this is a positive statement, nit a normative statement. We want is a normative statement. The firm, when they optimize, they set for-- optimization, involves setting marginal benefits equal to marginal cost, in every state of the world, optimization for consumers, optimization for firms.

I just said, well, instead of deriving this, you could derive this also from firm optimization. I just did a shortcut. I said the marginal benefit of hiring another unit of labor is this. The marginal cost is this. You set them equal. That's the firm optimization decision, OK.

All right, now, that's labor demand. Capital demand looks exactly the same. The cost for capital, the marginal cost, is the rental rate. What it cost to rent a unit of capital. The marginal benefit is the marginal revenue product of capital, which is the marginal product of capital times marginal revenue. That's the benefit.

Now, this is just harder to-- theoretically, we're done. Conceptually, it's a little harder for two reasons. First of all, as I said, it's hard to think about capital as having a wage rate. But once again, when we think about capital, think about renting a machine every period. So just like hiring a worker is essentially renting the worker, we think of hiring a machine as renting the machine, and we'll come back to that. But r is the price.

But also to you guys, what's MPK? What's the marginal product of capital? Well, it's just what the next unit of capital produced in terms of outputs. It's the same as workers. It's just if you have one more incremental unit of machine that costs r, how much does that increment your quantity? Just like if you have one more unit of labor that cost w, how much does that increment your quality? So it's just like the MPL. It's the effective quantity of the marginal additional unit, in this case of capital, OK, questions about that?

OK, that's all pretty straightforward. The more interesting part of today's lecture, is thinking about the supply side. And we're going to start today with labor supply. We'll do that for about a lecture and a half. And the next time, we'll start on capital supply. So let's talk about labor supply.

This is both some fun economics and some relevant economics because you guys have to decide how hard to work. Labor supply is fundamentally your decision of how hard to work. Now, your decision has many components. There's whether you work, there's how many hours you work, there's how hard you work every hour, there's which job you take, lots of components. OK, we're going to simplify things here into one decision, which is how many hours you work.

| imagine you're going to work. You're just deciding how many hours to work. And we're also going to assume you can choose it freely. Obviously, many jobs. You can't freely choose your hours. Your employer has a role, but we're going to assume you choose it freely.

So we're going to think about you. Forget all the other decisions you make about what job you're going to take and how much effort you're going to put in. Just think about you deciding how many hours am I going to work? And we're going to think about the economics of that decision. So we're trying to decide how many hours, H, an individual wants to work. OK, how do they make that decision?

Well, on the one hand, the more they work, the more shit they can buy. The more hours you work, you're in a wage per hour, and so you can buy more stuff. And we like stuff. OK, more is better.

So on the one hand, we want to work more because we want more stuff. On the other hand, and here's what gets really hard at MIT, normal people don't like to work. We are not normal people here. Most people actually think of work as a bad thing, I know, amazing, huh? Most people would rather not work.

So the trade-off is you'd rather not work. But by not working, you have less stuff. So the trade-off is a bad, which is working, against a good, which is stuff. The problem is, we don't know how to model that. We don't model transient bads and goods. That's too hard. So we're going to use a modeling trick.

And the modeling trick is we're going to define the complementary good to work, which is leisure. Leisure, we;ll just call 24 minus H. You have 24 hours a day. The amount of leisure you take is 24 minus the hours you work. By modeling leisure, if we solve for optimal leisure, then we simply use this simple relationship to solve for optimal hours.

But it's hard to think this way because fundamentally, I'm asking how hard you work, but that's not what I'm going to model. I'm going to model how hard you party, OK, I'm going to model leisure, OK. And work is going to be residual we're going to solve for.

I'm going to make the mistake, occasionally, of slipping into saying, it's a choice of work. It's not. It's a choice of leisure. And if you don't think that way, you can get the modeling wrong.

Because once we put it in two-good framework, we're back to consumer theory. We know what to do. We know how to trade-off two goods. We're doing that all semester. So we have two goods now, leisure and stuff, OK. And that's the trade-off we want to make.

And that's the general modeling trick is, instead of modeling a bad, we model the complementary good. Yeah?

AUDIENCE: Would you say it's similar to the trade-off between getting more points in the task versus getting more sleep, like [INAUDIBLE]?

JONATHAN GRUBER: Yes, that is a similar trade-off if you think about sleep as leisure. Leisure includes sleep. You got to sleep in this 24 hours. Sorry, guys, you do have to sleep in that 24 hours. So that's a similar thing.

So basically, you have this trade-off. So basically, we are going to model this. Now, what that means is, we need to model-- we know how to model the demand for goods. We've been doing that for weeks. But how do we model the demand for leisure?

So we're going to model the supply of labor by inverting it and modeling demand for leisure. And so we're going to basically take our standard model. And instead of trading off eating pizza and cookies, you're going to trade-off between leisure and stuff. And that is figure 15.1

Figure 15.1, and I've put all the stuff in one graph instead of walking you through it. On the y-axis, is consumption. Now, when I think of consumption, think of consumption as all the stuff you're going to consume, your pizza and your cookies.

On the x-axis, is leisure. You have a 24-hour maximum, so you can take between 0 and 24 hours of leisure. So as you move to the right on the x-axis, you're modeling leisure. Of course, that means that hours, you move to the left on the x-axis. Once again, we're not modeling hours, We're modeling leisure. Hours, we just get at the end.

So you then have a budget constraint, which is you can take 24 hours of leisure and consume nothing. That's the x-intercept. Or take no leisure and consume 24 times your wage. That's the y-intercept.

Now, let me just make one point. The y-axis is vague. What is consumption? And here's-- I'm going to come back to something I mentioned earlier in the class. We have complicated, multi-dimensional decisions. We do them sequentially.

Earlier I gave you income. Remember, I said consumer theory is easier than producer theory because income is just given to you. Now we're deriving where that income comes from. So the idea is you use a model like this to solve for your income, and then given your income, you go back to your cookies versus pizza model.

So right now, you're solving for how much I'm worth versus how much stuff I have. Later, I'll decide how to spend my money on that stuff. Right now, I'm deciding how much I want to work versus how much stuff I'm going to have in total. OK, so think of this as a sequential decision. We're now going back and taking that y that I gave to you and making a decision variable.

So that is the budget constraint. What is the slope of the budget constraint? The slope is minus w. The slope is minus w, OK. Oh, I'm sorry. We're going to make one other assumption to make life easy. We're going to assume the price of consumption goods is one.

That is, there's some aggregate consumption good you're buying with a price of one. This is a trick we call making a numerator good. It makes life easy. Otherwise, we'd have to track the price of consumption throughout.

Remember when we did pizza versus cookies, you had track the price of pizza versus the price of cookies and that ratio? By setting pc to 1, we no longer have a ratio to track just the level. So the slope of the budget constraint is then, instead of being minus w over pc, it's just minus w. Technically, it's minus w over pc, right? It's the slope of the budget constraint. But we're setting pc to 1.

So the slope of the budget constraint is minus w. What does that mean? That means that the price of leisure is the wage. In what sense is the price of leisure the wage? Why is the wage the price of leisure? Yeah?

AUDIENCE: Because [INAUDIBLE] leisure means you're not working, so--

JONATHAN GRUBER: Which we call opportunity cost. This is why economics is annoying. Because now every time you sit down to watch TV, I want you to realize you are paying something to watch that TV. You're paying the opportunity cost of not working, OK.

Leisure has a price. The price is the wage, what you could have been making by working during that hour. So the price of leisure, leisure is a good, just like cookies are a good. It's a good with a benefit in that it makes you happy and a cost, which you have to pay for it.

Here, you don't pay explicitly. I don't charge you to watch TV. You pay an opportunity cost, which is you're not working. You could have been working instead, OK. Questions about that? So that's your budget constraint.

Now, against this, you say you pay the well-defined utility function, where your utility function is u equals f of consumption and leisure. That is, there's two things you care about in life, how much stuff you have and how much leisure you have. That's the two positive things you care about. You want leisure. Remember, this is not MIT, OK? You want leisure. Those are the two things you care about in life, and that's the trade-off you make. And we know how to then maximize this utility function, OK.

So for example, suppose we write this in our favorite form, square root of c times l. Let's say that's your utility function. What's your budget constraint? Well, your budget constraint is that your consumption, the total amount expended consumption, this is really consumption times price of consumption. But we set that to 1, OK. Your consumption times the price of consumption, that's what you want to spend, equals 24 minus l times your wage. This is what you're spending. This is what you're making.

Remember, we're still assuming no savings. We said that early on. In this world, we're assuming people don't save. So every period, you're going to spend what you make. This is what you make. 24 liters minus l times w. This is what you spend. So that's your budget constraint.

We know how to solve this consumer optimization problem, which is we know that to optimize, you want to set the marginal utility, the ratio of marginal utilities, equal to the ratio of prices or the slope of the budget constraint. So you want to set minus the marginal utility of leisure over the marginal utility of consumption equal to minus the wage. Once again, over the price of consumption, but price of consumption normalized to 1.

So you want to set the marginal utility of leisure of the marginal utility of consumption equal to the wage. That's the optimization condition. That's just back to pizza and cookies, guys. Same thing, instead of pizza and cookies, it's leisure and consumption, OK.

Given the square root function, we know how to solve this, which is we know that this [INAUDIBLE] utility is going to be minus c over l. So we set minus c over l to the minus w. To solve this, just plug-in, take your marginal roots. We've done it a million times to the square root function.

So that's your optimization condition is that minus c over l equals minus w. We can then plug that into the budget constraint. Plug this into the budget. We have two equations and two unknowns. This is the budget constraint. This is the optimization condition. So it's two equations and two unknowns.

We solve it, and we get that if we, for example-- so we solve that, and we get that leisure, in this case, 24 minus 3 times w is equal to [INAUDIBLE] w. We get that leisure equals 12. The amount of leisure does not depend on the wage in this for this particular functional form of utility. It's generally not true. Leisure will generally depend on the wage. But for this particular model it doesn't.

So we get leisure equals 12. You take 12 hours of leisure. And consumption-- did I do something wrong? One second, sorry. --equals 12w, yeah, that's right. Leisure equals 12.

So for this particular case, you always choose the same amount of leisure. And consumption, therefore, is 12 times w. So you take 12 hours of leisure. You work 12 hours, and you get 12 times w in consumption.

That's mathematical. We could see it graphically in figure 15.1. You have an indifference curve, which is the ratio of marginal utilities, where that is tangent to the budget constraint is that 12 hours of leisure and 12w consumption. That is your optimal choice. You're done.

How hard do you work? Well, we have this equation. You work 12 hours. But we didn't get to that till the very end. We only cared about leisure through the whole model. OK, questions about that optimization?

Now, what happens if the wage rate changes? Well, we can't understand that without coming back and thinking about income and substitution effects. To understand the effect of a wage-rate change, we need to come back to income and substitution effects.

So to do this-- this is an uninteresting case because leisure doesn't depend on wage. I'm going to now move to a different case. I'm not going to do the math to show graphically where leisure does depend on wage.

So now, we're going to come back to how do consumers react when a price changes? Well, we know how consumers react when a price changes. They're substitution income effects. So let's go to figure 15.2. We have the original budget constraint 24 times w1. And let's say the wage now rises to w2. The wage rises to w2, OK.

The budget constraint pivots outward. You have the same consumption, which is zero if you don't work. But with every hour of work, you get more consumption. This slope is steeper. What effect does that have on how hard you work?

Don't look at the graph for a second. If I said to you, hey, the wage went up, you're going to work harder or less hard? Most people would say,

AUDIENCE: [INAUDIBLE]

JONATHAN GRUBER: What would somebody say? Tell me what you think. Yeah?

AUDIENCE: You have less work.

JONATHAN GRUBER: Why?

AUDIENCE: Because you keep the work less time at [INAUDIBLE] of money.

JONATHAN GRUBER: Fascinating, OK, most people would say the opposite, actually, which is, gee, I can make more, so I'll work harder. There's a more return to work.

But you've also given a sensible answer, too. which is, let's imagine I needed $1,000 to buy a computer. If my wage just went up from $20 to $40 an hour, I need to work less hours to buy that computer.

What you've just illustrated is that when it comes to labor supply, Giffen goods are not rare. When we did income and substitution effects, remember, the substitution effect always went the opposite direction of the price increase. The income effect depended on whether the good was normal or inferior.

Now, that's not going to be true. The substitution effect now, for leisure, will always go the direction of the price increase. Why? Because a price increase-- I'm sorry. The substitution effect will still go the opposite direction of price decrease. I'm sorry. The substitution effect still goes the opposite direction of price increase.

So let's do the substitution effect. The price of leisure has gone up. OK, so let's look at this graphically. The price of leisure has gone up. Why? Because you give up more by having leisure.

We can do the substitution effect, remember, by drawing the imaginary budget constraint, bc prime, that is tangent to the original indifference curve, but at the new price ratio. And what you see is the substitution effect is negative, like it always is. When a price goes up, you want less of something.

Substitution effect is always negative. When a price goes up, you want less of something. In this case, the price of leisure went up, you want less of it. And that's the standard intuition many people have. Most people, if you can earn more at work, work less hard or more hard, people say, I work more hard because I get more return for my work.

But the income effect, now goes the other way, even if leisure is normal. Before, to get the income effect to go the other way, we need pizza to be inferior. That's not true anymore. Why? Because think of what the income effect does here.

The income effect is as the wage goes up, I'm richer. When I'm richer, I want more of all normal goods. Leisure is a normal good, so I want more of it. So if leisure is a normal good, is this for everyone except MIT students, that as your income goes up, you want more of it.

So here, the income effect offsets the substitution effect without having a weird case. You don't need to be ramen. You don't need an inferior good. For a normal good, the income effect offsets the substitution effect. And that's why we learn the fucking income-substitution effects. They're a pain in the ass. It didn't matter for consumer theory, because I said there are no Giffen goods.

That's why we learn them because they do matter when it comes to factor supply. Income substitution effects do matter. So in fact, it's natural that I think of substitution effects that offset each other. Let's once again review what these effects are.

The substitution effect is g. Every hour of work makes it more costly to sit at home. So I'm going to work more. The income effect is, wow, I'm richer now. therefore, I want more of all normal goods. Leisure is a normal good, so I want more leisure, so I'm going to work less.

I find that effect very hard to understand. I think the best intuition is what we call the target-income model, which is what I used in the example here. Imagine you just simply want to work hard enough to buy x. You have a target income.

In that case, by definition, a higher wage caused you to work less hard. That was the intuition that was given here. That was the target-income intuition. That's the income effect dominating the substitution effect.

So whether a higher wage leads you to work harder or less harder, or in terms of the model, leads you to take less leisure or more leisure, will depend on the relative size of the income and substitution effects. So in figure 15.2, we've got a substitution effect that's larger than an income effect. Therefore, leisure overall goes down. The higher wage causes you to take less leisure and therefore, to work harder.

But in figure 15.3, we have the opposite. We have an income effect that dominates the substitution effect. Therefore, a higher wage causes you to take more leisure, not less.

Think about this. This is a Giffen good. This is saying a higher price causes you to want more of something, right? A higher price of leisure causes you to want more of it. But it's not a weird case. It seems sensible. In fact, that was the intuition that was given to me first.

So here, Giffen goods are not rare and mythical. They're real. Because the income effect, you don't need an inferior good, it's just the classic case of the income effect offsets the substitution effect. OK, let me pause there. That is a hard intuition. And let me see if people have questions about that.

OK, so here's the key point. If substitution effects dominate, then a higher wage leads to less leisure. So therefore, if we translate that to a leisure-demand curve, that translates to a downward-sloping leisure-demand curve. Demand curve slopes down.

I put this in the handout, but if you've got a leisure-demand curve where here's the amount of leisure, and here's the price of leisure, which is the wage, then it slopes down. Basically, the higher the wage, the less leisure you want.

But we don't care about leisure. In the end, we care about labor. This translates when we do labor to wage, to a rising supply curve. That is the wage goes up, you get more labor. So once again, we model this, but we care about this. We're talking about labor supply, remember, at the end of the day. That's what this part of the lecture is called.

So what it's saying is if substitution effects dominate, we get the typical upward-sloping supply curve we know and love. Indeed, when I we talked about labor markets before, that's what I assumed.

But in fact, that doesn't have to happen. If income effects dominate, then in that case, if income effects dominate, you're going to get a downward-sloping demand. If income effects dominate, you get a demand curve that looks like that and a supply curve that's backwards. You're going to get a downward-sloping supply curve, which is pretty screwy. But that's the implication.

If income effects dominate, then higher wages lead to less work, which is pretty crazy. Even though it was the initial intuition, we were just used to upward-sloping supply curves in this class. This would end up with a downward-sloping supply curve. OK, questions about that?

So this is really, really important because fundamentally, one of the key policy issues in America, is about how much workers get paid. For example, should we tax work? Should there be a minimum wage? What about unions? That's all about how much workers get paid.

Well, it's hard to evaluate that issue if we don't know what effect that's going to have. If paying workers more is going to cause them to work more hard, or less hard, that's pretty fundamental to understanding the implications of raising the wage. So what do we actually know?

Well, the evidence is actually fascinating. What do we know about labor supply? It's fascinating. What I'm going to do to understand this, is I'm going to talk about two groups. Prime age, that is 25 to 64-year-old married men and married women. Obviously, other groups aside, let's just focus on those for a second.

I want you to start by casting your mind back to 50 years ago, when I was a kid. When I was a kid, almost every prime-age man worked, and fewer than half prime-age women worked. It was a very different labor market than it is today.

So what I want you to think about in that world, I want you to think about and Intuit the size of substitution and income effects. So let's talk about married men and married women. And let's talk about their substitution effects and their income effect.

And I just want you to think about relative sizes. So let's start with the substitution effect. Who do we think would have a bigger-- in the world of 50 years ago, the typical sexist world where men were the breadwinners, women still worked but much less than men, who do we think had the bigger substitution effect and why? Think about what drives the substitution effect, and that'll help give the answer. Yeah?

AUDIENCE: Would women have a larger substitution effect? Is it a better alternative to [INAUDIBLE]?

JONATHAN GRUBER: Well, not better is normative. There's an alternative. Men, there's no alternative. If you were a man, [INAUDIBLE] good Lord, you didn't spend time with your children, no man did that. And you couldn't go golfing because your friends were all working. Basically, men 50 years ago, golfed and worked. It's kind of what they did.

OK, so basically, there's no substitution. You got to work. What else are you going to do? Women had alternatives. They were the primary child rearing, or even if they weren't, many women without kids just simply didn't work. That was an alternative. It wasn't viewed negatively socially, maybe not 60 years ago. But it was the alternative.

So the substitution effect could be quite big for women because they have alternatives. So they can decide, gee, when the wage goes up, that makes leisure more expensive, might want to work more. Whereas the men, they were already working, there wasn't a lot of decision to be made.

AUDIENCE: [INAUDIBLE].

JONATHAN GRUBER: Yeah?

AUDIENCE: [INAUDIBLE]

JONATHAN GRUBER: Oh, women, sorry, that's backwards, small, small, big, OK, Now, here's an even harder one. What about the income effect? I'm not going to ask this one because it's hard. The income effect is tricky because the income effect is not just how responsive your work is to income, but it also depends on how much you're already working.

If you're not working, if you are not working, then there's no income effect. Because my income doesn't change when the wage goes up. So my income changes more the more I'm working. So the income effect is really, technically, it's measured as dl or dh dy time y0, times your initial income.

Well if you're women, many of them didn't work. So they had a small income effect. Men, they worked. Sigma effect was bigger, now, maybe not big, but bigger. So you might say here, the income effect is bigger because women didn't have an income effect because they weren't working.

So you've got a situation where men have-- I did this wrong again, shit, bigger. OK, so we have a situation where men have a small substitution effect and plausibly, a bigger income effect. Women have a big substitution effect and not much of an income effect. Based on that, what should be the relative shapes of their labor supply curves? Who's labor supply curve should for sure slope up, and whose would be more uncertain? Yeah?

AUDIENCE: Women's slope up.

JONATHAN GRUBER: Women's curve would slope up because the substitution effect would dominate. Men's, we don't know. [? Social ?] effect small, the income effect might be big. It's certainly bigger than for women. We don't know. So in fact, we'd expect, intuitively, that women would have a strong upward-sloping supply curve. And then we wouldn't know, probably backwards, yeah?

AUDIENCE: What are the effects, or why isn't the income effects for men kind of small? Because they're going to work for--

JONATHAN GRUBER: It might be small. That's why it's saying it's uncertain. It's bigger but still probably small, OK. So we have for women, a clear big-- we'll call this zero. OK, we have a clear big substitution effect zero here. We know which way it goes. Men it's not clear.

Well, what does the evidence say? The evidence exactly lined up with our intuition, which is women's labor supply curves were very strongly upward sloping. Women had fairly elastic labor supply. The elasticity of labor supply for married women was about 0.5. That is, for every 10% increase in wages, women were 5% harder. For men, it was approximately zero, maybe a little bit negative, but roughly speaking, zero.

So basically, labor supply curve shapes comported with the intuition we get from theory. Now, what do we think has happened to the shape of women's labor supply curve over time and why?

AUDIENCE: As supply increase, does the substitution effect for men has also increased?

JONATHAN GRUBER: OK, you've skipped to men. Let's focus just on women. What's changed for women?

AUDIENCE: They have less domestic responsibilities because they share it with men.

JONATHAN GRUBER: Right, but does that make their substitution options better or worse? Are women freer in some sense, or less free to decide whether to work?

AUDIENCE: Freer.

JONATHAN GRUBER: I wouldn't say so. I mean, certainly female labor participation has gone up from less than 50%, to 80%. I would say if you ask many women who work, they wouldn't say they do so because it's free. They'd say do so because they need to. The family needs the money, or it's just, women's work has become, in some sense, like men's work. It's socially unacceptable to just hang out at home if you're a woman, like it was socially unacceptable for a man.

So in some sense, their substitution effects gone down because it's become more like men. They basically-- now working is the default. The women in this class all expect to go to work when they graduate. That was not true 60 years ago. Maybe here at MIT, but not most places, OK. So there's not much of a substitution effect because you're going to work.

Likewise, your income effect has gone up because now you have income. So women's labor-supply curve has gotten steeper. Their labor supply looks more like men. The amount they work looks more like men, so their labor-supply curve looks more like men.

Now, let me come back to that answer because part of the reason why is that you're wrong about one thing. You might think, well, gee, then men's labor-supply curves must be getting flatter, but they're not. Because men still don't take care of the kids. So basically, women work hard, and men work hard. The difference is the kids are now in child care.

So your intuition, which is, gee, women and men will trade off, men will become more flexible, that's wrong. Women became more inflexible, and men stayed inflexible. And the difference is child growth and childcare.

So basically, it's a fascinating-- your intuition on what happened to women, and once they gave you the man factor, you get the intuition of why women's labor supply became more inelastic, became more vertical. But partly, it's because men's didn't adjust either. And we're now in a world where basically, in almost all couples, both partners work. OK, questions about that?

OK, I want to end with an interesting application from one of my really favorite interesting empirical studies in economics, which is thinking about free trade-- we haven't talked about trade yet. We'll come to that in a few lectures, but I'll use some basic intuition, --and the impacts on child labor.

Now, what I want to do, is I want to set up the problem, but I don't want to rush, so we'll solve it next time. So Andrew, let's have these last couple diagrams be the first couple of diagrams in the next lecture's handout. So I want to set up the problem, but I don't want to rush to solve because it's a really important intuition, OK.

A common criticism of free trade, is that it will induce child labor. They will say, people will say, gee, if there's more free trade, that means countries are going to sell more stuff, that means kids are going to have to go to work. And that's a major reason to not allow free trade.

So we can actually analyze that and show why that intuition may be wrong. To see that, let's talk about the country of Vietnam. I was just in Vietnam this spring. Before the early 1990s, Vietnam could not export its main crop, which is rice because there was all these-- because war was going on. The US was still mad at Vietnam. There was a lot of barriers.

So Vietnam could not export its main crop, which is rice. So let's look at figure 15.4 to show what effect that has. And also Vietnam, also, wouldn't let farmers export rice. It wasn't just other countries who didn't want it. Vietnam wouldn't let it be exported. Vietnam said no, we need the rice here for our people. We won't export it.

So the rice market in Vietnam, is described in figure 15.4. On the x-axis, you have quantity of rice. On the y-axis, you have the price. You have a supply of rice that will be unchanged for this example, S sub v. That's the domestic supply of rice in Vietnam. And you had a domestic demand for rice. That's D sub v.

And the government said, we cannot export rice. So what that meant was the rice market will be forced at equilibrium, at that quota line, at a quantity Qv and a price Pv. That would be the government-enforced equilibrium. OK, what happened after 1989, is they let Vietnam export rice. In particular, after 1994, when the US normalized relations with Vietnam, they could export rice to the US.

What happened was that led to a massive increase in demand for rice because the rest of the world now wanted cheap Vietnamese rice. That shifted out the demand curve from Dv to Dw. Now it's the world demand for rice. OK, shift f Dv to Dw, which meant that Vietnam now produced more rice at a higher price.

And the criticism is, well, gee, to produce more rice, you need more labor. And a lot of that labor comes from kids. And we see that criticism in a diagram in figure 15.5. I think I will get through this now. Just bear with me. Might go one minute late.

Figure 15.5 is the diagram for child labor in Vietnam. On the x-axis, the amount of child labor. On the y-axis, is the wage. In pre-trade, we're in equilibrium with L1 kids working W1, working at a wage of W1. Now, we have free trade. What free trade does, is it increases the demand for labor.

The price has gone up, so if you flip back to figure 15.4, you need more rice. Q sub w is higher than Qv. How do you produce more rice? You have more workers. Some of those workers are kids. So that shifts up the demand for child labor from D1 to D2 and therefore, increases the amount of child labor from L1 to L2. And that is the story for why free trade increases child labor.

What does it miss? What it misses is the price of rice also went up. And when the price of rice went up, what did that do? It made the Vietnamese richer. As an American, I was quite frankly, as someone who grew up during the Vietnam War, I was a little afraid to go to Vietnam. What will they think of Americans?

They love Americans. And their hero is Bill Clinton. Why? Because Bill Clinton normalized trade with Vietnam and let them sell the rice in America, and their wealth went up enormously. What do you do when you're richer? You buy more of normal goods. What's a normal good? Your kid not working.

[LAUGHTER]

People in Vietnam care about their kids. They want their kids in school, not working. So while it's true the demand for child labor went up, the supply of child labor decreased because people didn't want their kids to work. So there was an opposite inward shift of the supply curve.

And indeed, if that shift was big enough, you'd see a shift from S1 to S2. If it was big enough all the way to S3, child labor could fall. In other words, even though there was more demand for child labor, the Vietnamese were so-- richer, so much richer. They said, we don't want our kids to work.

So there's a reduction in child labor supply that offset the increase in demand. And you could actually see child labor falling. There was a careful empirical study done of trade liberalization in Vietnam, and it found exactly that. That freer trade led to less child labor, not more.

A fascinating example, I can use basic economics to overcome what you might think is an easy intuition. All right, I'm going to stop there. Sorry to go long. We'll come back and talk about the minimum wage and capital supply next time.