14.01SC Principles of Microeconomics, Fall 2011
Transcript – Lecture 7: Applying Consumer Theory: Labor Supply

PROFESSOR: All right. So today we are going to start by reviewing income and substitution effects. Because that's a pretty hard concept and pretty central to a lot of what we'll do for the rest of the semester. And then we're going to dive in and talk about an application, a more interesting application, of income and substitution effects which is the effects of wages on labor supply.

So let's review. If you take the handout, grab the handout and look at the first figure, it's the same as the last figure of the previous lecture. To review, remember, whenever the price changes, a price change can be decomposed into two effects, the substitution effect and the income effect. The substitution effect is the change in the quantity demanded when the price changes, holding utility constant.

And as we proved last time, that is always negative, 0 or negative. It is always non-positive. It's always true that when a price goes up, the substitution effect is negative. We proved that both mathematically and graphically last time showing that if you're going to hold utility constant, and the price of a good is going to go up, you're going to shift away from that good. OK. That's the substitution effect.

In our example, we showed graphically how you measure a substitution effect. You draw a new imaginary budget constraint, BC3, which is parallel to the new budget constraint, BC2. So it's got the new price ratio but tangent to the old indifference curve.

So the key thing to understand is the imaginary budget constraint, BC3, where it comes from. It's parallel to the new budget constraint. That is it's got the new marginal rate of transformation, the new slope, but it's tangent to the old indifference curve. That gets you to point B. And so the movement from A to B is the substitution effect.

Then we have an income effect which is, in fact, utility isn't held constant when prices change. In fact, utility falls, because you're effectively poorer. You're effectively poorer. Utility is falling. And since you're effectively poorer, that further reduces demand if the good is normal. So if it's a normal good, if it's a good where lower income causes less consumption of it, the fact that you're effectively poorer further lowers the consumption from point B to point C.

So the total price effect is the one we demonstrated at the beginning of the last lecture. We raised the price of movies from $8 to $12. And we saw the number of movies consumed fell from 6 to 4. But what we can see now to understand what's underneath that is two things, an effect of the fact that prices change holding utility constant, and the fact that you're effectively poorer.

And that's the key thing. No, your income hasn't actually gone down. But that $96 your parents gave you can buy you less. Your opportunity set has been restricted. And that makes you effectively poorer. And so you buy less for that reason. And so you get the total movement from A to C.

Now, as we emphasized last time, this will be the case if it's a normal good. So substitution effects are done. Substitute effects are always negative, nothing fun about that. Income effects are a little more interesting, because goods can be not normal but inferior. We have inferior goods which are ones such that they're crummy stuff that as your income goes up, you want less of it.

And that can change the analysis. So if we look at Figure 7-2, now we're talking about the price change with an inferior good. And now imagine someone choosing between steak and potatoes. So now the choice is between steak and potatoes. And steak costs $5 a pound, initially, and potatoes cost $1 a pound. Initially, you have an income of $25. So someone has an income of y equals $25. The price of steak is $5, and the price of potatoes is $1.

So your budget constraint, your original BC1, runs from you can either have 5 steak, or 25 potatoes, or something in between. And so individuals choose point A where they're consuming 8.3 potatoes. They choose point A.

I don't know what the number of steaks is. We probably also ought to label that, the number of steaks that comes from that. But whatever. It comes out of the utility function. So then we say, now let's imagine that the price of potatoes rises to $3 a pound. There's a blight on the potatoes like there was in Ireland in the 1800s. There's a potato blight, and that shifts in the supply curve for potatoes raising the price of potatoes from $1 a pound to $3 a pound.

Now, what we know is that that will move consumers, given the utility function that we've chosen here, that will move consumers from point A to point C. Once again, that's not labeled, but some lower amount of potatoes. That will move them from point A to point C. So, ultimately, they'll choose fewer potatoes and fewer steaks.

But, in fact, what we can see is that's the composition of a substitution effect which is negative, and an income effect which is positive.

So if we do our standard decomposition, we draw a new monetary budget constraint BC3. It's parallel to the new budget constraint, BC2, so the same price ratio. It's parallel. But it's tangent to the old indifference curve at point B which is actually to the left of the ultimate choice at point C.

So the substitution effect takes us from A to B. The income effect actually takes us back from B to C. That is as that budget constraint shifts from BC3 to BC2, as you get poorer, you choose more potatoes. So the substitution effect would say that from the price change of potatoes alone, we go all the way to point B. We massively reduce our consumption of potatoes.

But because we're poorer, effectively, we now consume more potatoes. Because we're effectively poorer, we now consume more potatoes. And so, on net, you get a reduction in potato consumption. But it offsets the substitution effect. So that's when income effects can be a little more interesting. It's going to be a little more interesting exercise.

When you think about substitute effects in the same way, it's not that interesting. It's just look, quantity fell. It doesn't really matter why. You don't see, in the real world, substitution income effects. What's interesting is when they're opposed to each other. That's when it gets more interesting. And so you see this small reduction you get from the substitution effect alone.

By the way, there's two handouts. Right? Jessica, is there two handouts? There should be. There's tables as well. I didn't actually get it. Jessica, grab me one of those. There's tables as well as graphs. So make sure you have both handouts. Anyone else need tables? Am I the only one who didn't get it? OK, good.

So, in principle, the income effect could be so large it could offset the substitution effect. There's no reason, theoretically, that couldn't happen. That is, in principle, you could derive preferences such that the income effect is so large it offsets the substitution effect-- thank you-- and the price increase actually leads to more potatoes being consumed. That is what we'd call a Giffen good as I talked about last time.

So if you look at the table, the top table, this sort of lays out our possibilities. So look at the top table. It sort of maps out the possible sets of things that can happen. So if we have a normal good, and the price of that good rises, then we know that the substitution effect is negative. The income effect is negative. So the total effect is negative. Quantity falls. That's the law of demand. We talked about that last time, downward sloping demand curves.

Likewise, if the price falls, the substitution effect is positive. The income effect is positive. You're now richer because the price of the good fell. And so, therefore, demand goes up. Quantity consumed goes up, once again, downward sloping demand curve. Price rises, you consume less of it. Price falls, you consume more of it. That's what we learned about in the first lecture.

However, once goods are inferior, all bets are off. Because now the income effect is the opposite sign of the substitution effect. It's possible it could be larger. So the total effect is ambiguous. You could actually get an upward sloping demand curve. You could actually get that a price rise leads to more of a good, and a fall leads to less of a good. Now will you? Only if it's a Giffen good. And, in fact, there's a lot of controversy in economics about whether any good in the world has ever been a Giffen good. At most, there's maybe one or two examples people can find. Even then, it's controversial.

So I think it's fine in life to assume that demand curves slope down. I think, in fact, I don't see convincing evidence that any subset or set of goods are Giffen goods. I think it's just generally fine it life to assume demand curves slope down. Nonetheless, it's important to understand this theoretical possibility even if it's just theoretical. Because it's important to understand income and substitution effects. OK. Questions about that, either on substitution effect or price changes? OK.

So now, armed with that, let's go onto the more interesting case which is labor supply. It's more interesting, because as I'll come to in a few minutes, we talk about labor supply, labor is typically going to be an inferior good. So things are going to get a little more interesting. So let's talk about that.

So the question you want to ask here is how hard do folks decide to work? How many hours of labor do folks decide to provide? As we talked about when we talked about minimum wage, just as we all have to decide between consuming pizza and consuming movies, or consuming steak and consuming potatoes, we also have to decide between how much labor we're going to provide and how much we're going to consume.

The more labor you provide to the market, the more you consume, but the less fun you get to have. Fun, we call leisure. The less labor you provide to the market, the more fun you get to have, the more leisure you get, but the less you get to consume, because you have less income. And that's the trade-off we talked about when we talked about the effect of minimum wage.

Now let's come back and get underneath that labor supply curve. So we talked about the minimum wage. We talked about the labor supply curve which was how the hours you provide respond to the wage and a labor demand curve, which was how the hours that firms want respond to the wage.

Now let's get underneath the supply curve. A minute ago, we were talking about the demand curves and getting underneath the demand curve for consumers. Well, now let's get underneath the supply curve for labor.

Now, the key thing is that when we talk about labor, it's not a good, it's a bad. The typical person doesn't want to work. The typical person is not in this room. You guys like to work. The typically person actually doesn't like to work.

Leisure is a normal good. For the typical person, leisure is a normal good. They like time off. Leisure is a good, which means labor is a bad. They don't like to work.

The problem is we don't know how to model bads in economics. It's just we're used to trading off between two things you want. When I used to trade-off, we know how to model something you want to get something you don't want. Indifference curves wouldn't work, because more wouldn't be better. If you drew an indifference curve for labor, it would violate the more is better assumption. Because you wouldn't want more. You'd want less.

So the modeling trick we're going to use whenever we're modeling bads, is to model the complementary good and then, in the end, solve for the bad. We're not going to model labor. We're going to model leisure. And given the total amount of hours you have to supply, the total hours minus the amount of leisure is the amount of labor. So we're going to model leisure. We're going to model the good and then solve for labor at the end.

So, in other words, if you have 24 hours a day you can work, then your amount of hours of work is 24 minus the amount of leisure N. Call it N or call it L. We'll call it N because L, typically, we think of as labor. Let's call leisure N for reasons I don't quite understand. Let's just use that.

Basically the amount of hours you can work is 24 minus leisure. So if we solve for the optimal amount of leisure you want, we can obviously get the amount of labor you supply. So the trick when modeling a bad is not to model the bad. It's to model the complementary good. In this case, the complementary good is leisure.

So we're going to model the trade-off between leisure and consumption and use the result of that to solve for the amount of labor you supply. So it's the general modeling trick you need to understand, which is turn a bad into a good. That's the modeling trick. Because we know how to model the trade-off between two goods. We don't know how to model the trade-off with a bad.

So to think about that, let's go to Figure 7-3, and let's talk about what's underneath a labor supply curve. What's underneath a labor supply curve is the trade-off between how much leisure you want and how much consumption you can have. So you see here, here's a trade-off. On the y-axis is the amount of goods you can have. You earn a wage, w. The y-axis is the amount of goods you can have from a day's work.

So you earn w per hour. That means the most goods you can have from a day's work is 24w. If you worked all 24 hours at that wage, you can have 24w goods. On the other hand, if you work not at all, then you take 24 hours in leisure and have no consumption from that day.

So we see as you move to the right on the x-axis, that's leisure. That's the good. As you move to the left, that's labor. That's the bad. OK? That's just illustrating. But we're going to model the good. We're going to model leisure. Your trade-off is between how much you want to consume and how much leisure you want to take.

Now, here's what's interesting. In general, what determines the slope of a budget constraint? What determines the slope of a budget constraint?

AUDIENCE: Marginal rate of transformation.

PROFESSOR: Which is what?

AUDIENCE: Ratio between prices.

PROFESSOR: Ratio between prices. Prices determine the slope of the budget constraint. But here's what's tricky. What's the price of leisure?

AUDIENCE: Wage.

PROFESSOR: The wage. Why?

AUDIENCE: Because for every hour you take having leisure, you are effectively using money that you could gain at work.

PROFESSOR: Exactly. The key is the economic concept of opportunity cost, which we've talked about and will continue to talk about this semester, opportunity cost. By not working, you are forgoing earning a wage. So that is the price of leisure. You may not think of it this way, but, once again, that's why we're the dismal science.

When you go home today, and you sit on the couch, and you watch TV for an hour, you have just paid a price. And that price is what you could have earned by working that hour. Every action has a price. And the price of leisure is the wage you forgo, The wage you forgo by sitting around is the price of leisure.

Let's assume here that the price of goods is $1, that the goods you're going to buy cost $1. Whatever your consumption, it costs $1. That's the trick we always use with modeling. Make as many things $1 as you can. That makes the model easy. So let's assume that the price of the goods you're going to buy are $1.

So the slope of the budget constraint is minus w over 1. The slope of the budget constraint is just the price of leisure which is minus w . So the trade-off with the price of goods of $1, the trade-off between taking leisure and consuming is that if you take leisure, an hour of leisure, you get w fewer goods. And if you work an hour, you get w more goods, but you lose an hour of leisure. And that gives you the trade-off between how much you consume and how much leisure you take which determines how much you work. OK. Questions about that?

Now let's take this framework and ask, what happens when the wage changes, Figure 7-4. So we have an original outcome with the budget constraint BC1. We have an original budget constraint, BC1. Now imagine the wage goes up, so we move to BC2. BC2 is a budget constraint with a higher wage. The wage goes up.

So what we're going to see is you're going to move from point A where you work N1 hours to point C where you work N3 hours. That's where your indifference curves are tangent with the new budget constraint. Not work, take leisure. I'm sorry. We take leisure of N1 hours to leisure of N3 hours. The wage going up has reduced your leisure which makes sense. If the wage goes up, you work harder. Right?

So your wage going up, we always first take if there's a leisure and then convert to labor. Wage goes up, leisure falls from N1 to N3, which means labor goes up. But actually two things are happening here, the substitution and income effect. The substitution effect, which we see by drawing the imaginary budget constraint BC* which is parallel to BC2 but tangent to the original difference curve, the substitution effect is a very large reduction in leisure. It moves all the way from N1 to N2. The substitution effect is a very large reduction in leisure.

The income effect is that leisure is a normal good. I'm now richer, because my wage has gone up. So I want to buy more of it. So I buy more leisure. And that moves me from N2 to N3.

So, basically, now the income effect offsets the substitution effect even with a normal good, or with a normal good. With a normal good, the income effect offsets that substitution effect. And that's because the money you're getting, you're using to buy leisure.

So, in fact, if you flip to 7-5, you can see a case where the income effect dominates. And you actually get that a wage increase leads you to work less hard. Now, think about that. If I'd said to you-- I probably should have started with this-- if you increase the wage, will people work more or less hard? Your initial instinct would have been more hard. You would have thought, well, if your wage goes up, you work harder. But that's because your instinct was focused on the substitution effect. You're thinking about the income effect.

Here's a case where I started at N1. The substitution effect leads me to N2. But I feel so much richer from that higher wage that I actually move all the way to N3. My leisure goes up, and I work less hard.

Now, unlike a Giffen good, this is totally plausible. Why is it plausible? Well, let me do give you a simple intuition for why it's plausible.

Let's say that you're someone who has a certain amount of things you want to buy every week. You don't save. You have a certain amount of things you want to buy every week. You have to pay your rent, you have to buy your food, you have to buy your other goodies, a certain budget. A lot of people live on a budget. You have a certain budget. And the truth is you're happy with that budget. That's kind of what you want to do.

Now let's say I doubled your wage. Well, now to meet the budget you can work half as hard and still meet the same budget. So you'll work less hard. You could say, look, I can get more leisure and consume the same amount of goods as I did before. So I'll work less hard.

That's a totally plausible case. That's a case of what we call target income. If someone has a target income, and their wage goes up, they'll work less. Now, that's not necessarily the truth. But it's, at least to me, sort of a plausible case of how people might behave. And that's a case where income effects can dominate.

So if we, once again, go to the second chart on that page, now we see the income and substitution effects for labor supply. Once again, we're assuming leisure is a normal good. We're always going to assume leisure is a normal good. We're never going to assume people don't like leisure. Assuming leisure is a normal good, then as the wage rises, the substitution effect is you take less leisure.

This table is a bit different than the other table. Instead of the first panel being normal and the second panel being inferior, the first panel is what happens to leisure. The second panel converts it to what happens to labor. So for instance, in the first cell, when the wage rises, the substitution effect on leisure is unambiguously negative. You clearly take less leisure when the wage rises. So, likewise, you have more labor. So on the bottom panel, labor is clearly greater than or less than 0.

But the income effect is positive for leisure. You're rich, you take more leisure. Or, likewise, negative for labor, you're richer, so your work less hard. And, therefore, the net is ambiguous.

So with goods consumption, we needed goods to be inferior for there to be a Giffen good type phenomena. Here, even with leisure being normal, you can have a Giffen good type phenomena. It's much less random.

And, in some sense, this is why we learn income substitution effects. To be honest, they're just not that interesting for consumption. The book makes a big deal out of them and talks about consumer price indices and all that. It's just not that important for consumption. Because we know in consumption if prices goes up, you consume less. It's just not that interesting.

It's much more interesting for things like labor supply. And we talk about savings in a number of lectures. It's the same thing. There, it's more interesting. Because now they can often offset each other in meaningful ways. And so now this is why the tools of income and substitution effects become much more important. OK?

So if we put this together, if we go to Figure 7-6, we can now think about deriving where labor supply comes from. Where does labor supply come from? Well, first, you've got the consumer's decision of how hard to work.

So here's a case. It's sort of small, but you can take a look. Here's a case where you've got someone initially working, taking 16 hours of leisure and, therefore, working eight hours, at a wage of W1. Now their wage goes up to W2. They choose to take 12 hours of leisure and, therefore, work 12 hours. This is someone who works harder when the wage goes up. That is, the income effect does not offset the substitution effect.

Now, we can take that to draw a demand for leisure curve just like we drew any other demand curve. It's the same technique as last time. Just bring those point and say, look, at a wage of W1, leisure is 16. At a wage of W2, leisure is 12. We have a downward sloping demand for leisure, standard downward sloping demand for leisure.

But we can convert that to a supply of labor, which is what we care about. Nobody cares about the demand for leisure curve. We care about the supply of labor curve. You just subtract these from 24. You use the supply of labor curve which is upward sloping. So as long as substitution effects dominate income effects, we'll get an upward sloping labor supply curve.

But it's certainly possible that if income effects dominates substitution effects, you could get a downward sloping supply curve, if you will, what we call in labor economics, a backward-bending supply curve, a supply curve that goes the wrong way. Instead of sloping up like supply curves are supposed to, it goes the wrong way and slopes down.

And we can see that's plausible. The target income case I just described to you would deliver that. The target income case I just described to you would deliver a downward sloping supply of labor. As the wage rose, people would work less and less.

That's a totally plausible case. And that's why income and substitution effects are interesting. Because they can deliver this weird result. They can get the wrong signed supply curve. Questions about income and substitution effects or labor supply?

So what I want to spend the rest of the lecture on is talking about well, what is the case? Do labor supply curves slope up or down? And what do we know about that? Well, this is probably the major focus of a field we call labor economics. And there's an excellent course on labor economics, 14.64 taught by Josh Angrist, which goes into much detail in the entire field. But one of the main focuses of the field is understanding the elasticity of labor supply, and is it positive or negative, and how big is it. So, basically, measuring the slope of the labor supply curve is the focus of this literature, the elasticity of the labor supply.

Now, what I want to do is start with a historical fact, and then I'll come to the modern age. Let's think about 30 years ago. 30 years ago, all men worked and less than half of women worked. It was more normal for women not to work than to work, married women. I'm sorry. Less than half of married women worked.

Now, married women could work. I'm not talking 60 years ago or 80 years ago when there were marriage bars. Literally, firms wouldn't hire you if you were married. It's true. If you're interested in that, you can actually read Claudia Goldin. She's a labor historian who's written about the early 20th century when, literally, women could be fired for being married. We're not talking about that era.

I'm talking about 30 years ago when you could work if you were married. It's no problem. But most women chose not to, maybe 40 years ago now.

So, in that case, let's think about two groups. Let's think about married men, and let's think about married women. And let's just posit, hypothetically, how big we think their substitution and income effects would be.

Let's start with substitution effect. Do we think the substitution effect would be bigger? This is the change in the wage holding utility constant. Do we think that would have a bigger effect on leisure and, therefore, labor for men or for women and why? Don't yell it out. Somebody, raise their hand and tell me. Do we think that the substitution effect would be bigger for men or women and why? Remember the name. It's the substitution effect. That's the key to the answer. Yeah.

AUDIENCE: I think it would be the same, because they each have equal use for the goods. Maybe their income effect would be different.

PROFESSOR: OK. [UNINTELLIGIBLE PHRASE]. They each have equal use for the goods. Well let's deal with where the substitution effect comes from. Let's break it down. So you're someone who's deciding. You've got you and your wife, and you're each deciding how to respond to a change in the wage. Now, you both value the goods the same. But it's goods versus leisure.

What's the other feature that you're going to be thinking about? Think about a married man 40 years ago, and the wage goes down.

AUDIENCE: They have to work more.

PROFESSOR: No. We're just doing substitution effects. That's unambiguous. If the goes down, they work less. We're just doing substitution effects. That's ambiguous.

The question is, if they work less, what do they do? Whereas think about a married women 40 years ago. If she works less, what does she do? What does a married man do? Nothing. There's nothing to do. Your friends are all at work. You can't go play golf. You can't do anything. You don't take care of kids, because men didn't take care of kids 40 years ago. What do you do? There's nothing to do.

Whereas a woman, married woman, if the wage goes down 40 years ago, you can take care of kids instead. You can hang out with other women who aren't working. There's plenty to do.

Based on that, now change your answer. Where do you think the substitution effect would be bigger?

AUDIENCE: [INAUDIBLE PHRASE].

PROFESSOR: In women, it would be bigger. Because men, there's less of a substitution effect. Because it's all about substitutability of options. There's no good alternative option to work for men 40 years ago. It's either work or nothing. Basically, everybody worked. So, basically, there's no good substitution effect option for men.

For women, there's lots of outside options. There's sociability, there's child rearing, et cetera. The substitution effect will be larger the more things there are you can substitute to. Men don't have anything to substitute to from work. Women have options to substitute to from work.

For men, this is going to be very small. For women, this will be big. We know the sign. The smallest this can be is 0. We know the sign. But it's going to be a very small substitution effect, because I don't have a lot else to do if my wage goes down. Women, if it's a low wage, why work? You can be much more effective taking care of the kids or hanging out with your friends. Why work for a low wage? Men, there's nothing else to do. So that's the relative size to the substitution effects.

Now, the income effect, I think, is a little bit harder. And let's come back and think about what drives an income effect. We talked about the income effect as being delta q over delta y, how much a quantity changes when your income changes. But, in reality, what's going to matter for your income effect given when you start today, is going to be not only delta q over delta y, how your taste for work changed or income changes, but also how hard you worked to start.

Think of it this way. The income effect is how much richer you feel if your wage goes up, or how much poorer you feel if your wage goes down. If you are working 0 hours, the income effect is 0. You don't feel any richer if the wage goes up, because you don't earn any money. The more hours you work the bigger the income effect is, because the bigger that shock is to you.

So we can think of the income effect, a shorthand for the income effect, is going to be h times dh/dy, the hours you work times how your hours change with your income. OK? Now, to prove this it involves using complicated algebra. We're not going to get into it in this course. I worked hard last night to see if I could make the algebra less complicated, and I can't. I just have to try to work intuitively on this.

The notion of the income effect is bigger the more you're in the market. You can think about it for goods too. Think about the income effect of a change in the price of something you buy a lot of for something you buy very little of.

So let's say you're someone who's buying two Starbucks a day, and you very rarely go see a movie. Well, if the price of a movie goes up 10%, or the price of Starbucks goes up 10%, which is going to make you feel poorer? The price of Starbucks going up, because you buy a lot of Starbucks. So how much poorer you'll feel, or the income effect, will depend on your starting point. The more you're in a market, the more you'll feel the income effect.

Now, based on that, who's going to have a bigger income effect, men or women? Same person, what do you think? The income effect is going to be stronger the more you're in the market. So who's going to have a bigger income effect?

AUDIENCE: Married men would have a bigger income effect.

PROFESSOR: Exactly. Married men would have a bigger income effect, because they're in the market. Married women, most of them don't work. So there's no income effect. So this is going to be big for men and small for women.

There's another issue, which is does dh/dy differ for men and women? I'll leave that alone. Let's assume they both have the same underlying income elasticity. But, certainly, the initial hours are much bigger from men than for women.

So what does this mean in terms of the labor supply curves you would see for married men and married women 40 years ago? Based on these facts, what would you think? Yeah?

AUDIENCE: They would have opposite slopes.

PROFESSOR: Yeah. So, in particular, the female labor supply curve would look like what? It would slope up or down?

AUDIENCE: It would slope up.

PROFESSOR: It would slope up. You'd have an upward sloping curve, because you'd have these big substitution effects and small income effects. So it would look much more like Figure 7-4. You'd have the big substitution effect when the wage goes up and a small offsetting income effect. Think about the woman who is not working at all. She's now working at all at $8 an hour. You raise her wage to $12 an hour. She's like, hey, I wasn't working at all. So there's no income effect. But now I'm going to go to work and make some money. So it's upward sloping.

But for men, it's going to look more potentially like Figure 7-5. There's a small substitution effect but a potentially big income effect or bigger than women. Now, how big it is, that's not clear. Because, once again, men have nothing to do if they don't work. So it could be this ends up being bigger and smaller. It's not clear how big this ends up being. But it's at least possible that you could have men having a backward-bending or downward sloping labor supply curve. Because the income effect could even more than offset the substitution effect.

But, in reality, given the way I set up the example, you'd think men would basically have a pretty inelastic labor supply. You'd think, 40 years ago, these things would basically both be 0, both offset. And, basically, you'd have a situation where the change in the wages didn't matter much for men.

And, in fact, that's what people found. This is a wonderful case of the convergence of truth with theory and a wonderful chance to see the power of some pretty simplistic theory. The intuition is exactly borne out in the data, which is males, 40 years ago, would have a very inelastic labor supply. Their labor supply curves were virtually vertical and maybe backward-bending. There's some controversy on that. Some estimates got backward-bending. Some didn't. But there were certainly not upward sloping. It was basically vertical.

Women had a very few elastic labor supply. The elasticity is estimated to be around 1. That is every 1% change in the wage lead to 1% more labor supply. So that's a fairly elastic labor supply for women. Where, for men, the estimate was basically 0. And that's kind of neat, because we're actually getting confirmation in the data of what the theory would have told us.

Now, someone else tell me what do you think has happened over the last 40 years relative to these elasticities of married men and married women. Yeah.

AUDIENCE: The elasticity of married women has gone down in the last 40 years--

PROFESSOR: Why? Speak up so the class can hear you. Why is that?

AUDIENCE: Because women work more often now than they did before.

PROFESSOR: Women work more often now. So the income effect is going to be getting bigger for them. So the income effect is going up, because their initial h is bigger. Plus there's actually now, in some sense, less good opportunities if you're not working.

So when we had our first kid, and we lived in Brookline, which is sort of an urban city, and my wife decided to stay at home, she didn't have moms to hang out with. It was just nannies at the park. And it wasn't that much fun. And so, basically, the substitution effect is shrinking, because the outside options aren't quite as good as they were, as the norms shift towards work.

Whereas for men, actually it's becoming more normal for men to be engaged in child care. My best friend is a stay-at-home dad. It's becoming more normal for that to happen. And so the substitution effect is rising. It's not implausible that if you cut a man's wage down, he'll just say forget it. My wife's going to work. I'm taking care of the kids. That would be socially ostracizing 40 years ago. But it's not that odd now.

And, likewise, as men are less engaged in the labor force and spending more time at home, their income effects are falling, because their initial h is smaller. So you're getting a convergence in these labor supply elasticities.

What really seems to be happening is mostly convergence down for women, not much up for men. So men are maybe going from 0 to 0.1. Women are coming from like 1 to 1/2. So what you're seeing is that men aren't actually working that much less. There's a few stay-at-home dads. But they're still not the majority. Women are working a lot more, and kids are in child care a lot more.

So what you're seeing over time is you're seeing men being a little more responsive, but not that much more responsive. They're still, basically, working all the time. Women are working a lot more and being more responsive to wages. And there's a reduction coming in both women's leisure and production of child care at home.

Now, that raises a very interesting question of is this is a good thing? Now this is a very deep and hard topic. In economics, we think if people do something it's good, or they wouldn't have done it. It is true that if you look at data on self-reported well-being or happiness data, married women report a general decline in happiness, over the last 40 years, as they've entered the labor force more and more.

And the issue is, is this something which is a good way for society to spend its resources, to have everyone working? We're consuming more. Consumption has gone up. We're consuming more, but we're getting less leisure as a family. Because the men aren't working that much less. The women are working a lot more. So we're getting less leisure as a family. How do we feel about that outcome. That's an interesting question. And we'll talk about that some more later on in the semester. OK. Questions about this? Yeah.

AUDIENCE: [INAUDIBLE PHRASE].

PROFESSOR: That's a really good question. And let me talk about that for a couple of minutes. The definition of unemployment is those employed over looking for work. If the number of people employed does not change, and women suddenly want to work, and they report to surveyors that they're looking for work-- that's the employment rate. I'm sorry.

The unemployment rate-- I'm sorry-- is going to be those looking over employed. My bad. The unemployment rate is going to be those looking over those employed. So the unemployment rate is how many people are looking for work over how many are employed. If women start suddenly looking for work, and there's no jobs to be had, that will raise the unemployment rate.

So one thing that's been a focus of a lot of research has been do increases in the supply of labor lead to increases in unemployment? What you've expressed is what's often called the lump of labour view. The lump of labour view is basically the view that there's a fixed box of production in the economy. And as more workers come in to fill that box, there will be more unemployment.

The alternative view is that the economy is dynamic. And as more women are working, and earning income, and buying stuff, that makes more jobs. So our standard of consumption is way higher than 40 years ago. We all have much cooler stuff than 40 years ago. You have no idea how bad life sucked 40 years ago. We have way better stuff. We have that stuff, because women are working and making the income to buy it, which means people have to make it which makes jobs.

So, in fact, the existing evidence is labor supply shocks do not cause unemployment increases. This is something I've worked a lot on. What you see, a very interesting case is in Europe. In the US and all over the world, we have assistance of what we call Social Security, a term you've all heard, I'm sure. The Social Security program is a program which provides income when you're retired. So it provides income when you're retired to help you deal with the fact that you don't have a source of labor income anymore. And that's a program that virtually every country, and all developed countries have a very generous social security program.

But they're different in the US than in other countries. In the US, the way the social security program works is when you hit 62, you get a choice. You can stop working and get your benefits from Social Security, and then you get them every year until you die. Or you can keep working, delay getting your benefits, but they'll increase what you get to offset the delay. So, in other words, if I retire at 63 rather than 62, given that I'm going to die at the same date, I'm going to get one fewer year of benefits in my life. But they raise them by 6.7% to compensate for that. So I get one fewer year of benefits, but every year it's 6.7% higher. And it turns out, given life expectancy, that works out to be a roughly fair deal.

So, basically, at 62, your choice is I can get one more year of benefits or I get higher benefits for one fewer years. And that's a choice that's a roughly fair deal. OK. Questions about that? Am I making sense of that?

In Europe, it's not a fair deal. In Europe the way it works is they say, you can get one more year of benefits. But if you decide to work this year, we're not given you any more in the future.

So let me describe how it works in the Netherlands. At age 55, the Netherlands says, if you decide to retire this year, we will replace 90% of your wages in social security payments to make sure your income doesn't suffer when you retire. If you don't retire and work, you're going to give up sitting at home earning 90% of your wage. That is the opportunity cost of working. It's that you have forgone the ability to sit at home and get 90% of your wage. So what is your net wage if you work? 10% of what you would have earned.

So if you're earning $20 an hour, then your choice is you can sit at home for $18 or work for $20 an hour. So your net wage for working is $2 an hour. The return to work, the opportunity cost of leisure is only $2 an hour. You're only forgoing $2 an hour by sitting at home.

But wait, there's more. If you sit at home, you don't have to pay the payroll taxes of financing the system that are almost 50%. If you work, you have to pay the payroll taxes. Which means that if you work, you lose money. Because if you work, you forgo getting to sit at home at 90% of your wage, and you pay a tax that's about 40% of your wages. So, actually, you will lose 30% of your salary by working relative to sitting at home.

Guess what people do in the Netherlands at 55? They sit at home. No one works after 55 in the Netherlands on the books. They work off the books painting houses and doing odd jobs. No one works on the books after 55. Economics works, guys. If you pay your guys to stay at home, they stay at home.

Now, if you ask European politicians, why do you have this screwed up system? They'll say, well, it's easy. We want to get those old guys out to make jobs for the young guys. We need to pay those old guys to stay at home to make jobs for the young guys.

And then you point out, have you noticed that Europe has higher unemployment than American, even though we don't do that and you do? And that's because you're wrong. It doesn't work that way. Because by paying the old guys to sit at home, you have to have such high taxes that no one makes new businesses. And so there's not jobs for the young guys to have.

So it's true. In theory, you've made jobs for the young guys by leaving the old guys at home. But by imposing the 40% tax rate that you've had to impose to make it possible to pay the old guys to sit at home, you've killed job creation in your country. And, as a result, there's not the jobs for young guys to get.

That's a very long-winded way of answering your question that supply, in substance, creates its own demand. So more labor supply will not necessarily cause more unemployment.

And we're going to talk about one more thing before we stop. I've just talked about a vast empirical literature in how people understand the effects of wages on labor supply. Well, how do they do it? Well, you could say, look, we can just look at how you earn a higher wage than you do. And we'll ask, do you work harder than you? And we'll say, the guys who earn higher wages work harder. If guys who earn higher wages work harder, that means labor supply slopes up. If guys who earn higher wages don't work harder, that means labor supply slopes down. What's wrong with that? Yeah.

AUDIENCE: Those who are getting paid more probably are getting paid because they want to work harder.

PROFESSOR: Yeah. Maybe you guys are different. Maybe you're talented, and you're not. And maybe because you're talented, maybe you're driven, and you're not. And because you're driven, you work harder and get paid a higher wage.

So I'm not learning anything about the causal effect of the wage on your labor supply. I've just documented a correlation between wage and labor supply. How can we get the causal effect of your wage on your labor supply?

Well, once again, ideally we'd run an experiment. We'd assign you a higher wage. We'd find someone just like you. Not you, you're not driven. We find someone just like you. No offense. You know I'm joking. We'd find someone just like you and, randomly, by a flip of a coin, assign them a lower wage. And we'd see how your labor supply differed.

Now, it seems like you couldn't do that. But, in fact, the US did that. In the 1970s, we ran what was called the negative income tax experiment where we literally assigned people different wage rates through taxing them by different amounts. And that was part of what gave us this very convincing evidence from 40 years ago of these responses. So where we get this is from a real experiment we ran 40 years ago.

The problem is that's a pretty hard experiment to run. It's pretty expensive, and there's some ethical issues. So what do you do today to estimate that? What you can do today is say, well, we can't run the experiment. But the government runs it for us every time they change tax rates.

Because if you take two people that are identical-- so let's say you and you were identical-- and I change your tax rate because you live in Massachusetts. I don't change your tax rate because you live in New York. I can see what happens to you relative to you. Because I've now essentially run this experiment by the government changing someone's tax rate and not someone else's. That's the way we do it if we can't run a true, randomized experiment. And that gives very, very similar answers.

Let me stop there. And we will come back. Next lecture we'll talk about applying this model. So I guess in section on Friday, we review for the exam. In section on Friday, we review for the exam. So show up to that. And the exam is next week. The exam will cover through my next lecture.