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JONATHAN GRUBER: Today, we're going to continue our discussion of consumer choice. And we're going to talk now about what happens when we take that unconstrained choice we talked about on Monday and impose budget constraints. We'll talk about what budget constraints are. We'll then come to talking about how consumers make constrained choices. And then we'll end with an example of food stamps.

So let's start by talking about budget constraints. And we'll start by talking about their construction, the construction of budget constraints. So, basically, last time, we talked about the fundamental axiom of consumer choice that more is better. So what stops people from just bingeing on everything? It's their budget constraint. It's their limited resources.

Now, for most of this course, we're going to make a simplifying assumption that your budget-- that is what you spend-- equals your income. That is what you earn, OK? That is there won't be any savings or borrowing, OK?

Now that is a simplifying assumption. And, indeed, we'll spend a couple lectures at the end of the semester talking about what happens when people can save or borrow. That said, this is not a terrible description of most Americans. The median American household has $400 in the bank. So this is not kind of a terrible description of the way most people live their lives in America, which is what they earn each week is what they spend each week.

So that's what we'll do. It also might not be sort of a terrible description of your life. I presume, in college, you're not doing a lot of savings. You maybe do a little borrowing, but not a lot of savings or borrowing.

So what we're going to do is we're going to assume that's true for you as well. We're going to assume your parents have given you some amount of money to spend. We'll call it Y. Your income Y is the amount of money your parents have given you to

spend for say the semester or the month.

And, once again, let's say all you spend your money on is pizza and cookies, OK? That's all you want to spend your money on. We write the budget constraint as saying that your resources, your income Y, can be spent on either pizza or cookies.

And the constraint is that you could spend it-- that budget has to be divided between pizza, where there's the price per slice of pizza times the number of slice of pizza, or cookies. We have the price per cookie times the number of cookies.

So p sub p is the price per slice of pizza. p sub c is the price per cookie. P is the number of pizzas, and C is the number of cookies. That's your budget constraint. You can essentially devote your income to some combination of pizza and cookies, but you have to consider how much they actually cost in doing that.

I find this easier to see graphically. So let's turn to figure 3-1. Figure 3-1 shows a budget constraint. So how does the budget constraint look? Well, the x-axis is your income divided by the price of cookies. That is, if you decide to devote all your income to cookies, then how many cookies can you have? Y over pc. If your income is $100, and cookies are $10-- that means you're going to Insomnia Cookies-- then you can only have 10 cookies, et cetera.

Likewise, the y-intercept is the income divided by the price of pizza. That's how many pizzas you can have. The budget constraint represents-- the budget constraint, the slope of the budget constraint, is the price ratio, the negative of the price ratio because it's a downward-sloping line, pc over pp. That is every extra cookie that you buy, holding your income constant, lowers the amount of pizza you can have by p sub p, OK? So let's consider an example.

Suppose that Y is $96, that the price of pizza-- it's an expensive pizza place-- is $12, and the price of a cookie is $6, OK? $12 for pizza, this is like downtown San Francisco or New York. $96 income, $12 for a slice of pizza, $6 for a cookie, OK?

I'm sorry. Y is-- I wanted to make Y 72, my bad. So Y is 72. Your income is $72, OK? And you can spend it on pizza and cookies, and those are the prices.

Now what that means is, if you wanted just pizza, you could get six pizzas. If you

wanted just cookies, you can get 12 cookies. And, generally, the rate at which you can trade off pizza for cookies is minus 1/2, OK? That is every additional cookie would require giving up half a slice of pizza, OK? Every additional cookie requires giving half a slice of pizza. That's why the slope would be negative 1/2, OK?

So, basically, we're going to call the slope of the budget constraint-- the slope, we are going to call the Marginal Rate of Transformation, the MRT. Last time, we did the MRS, the Marginal Rate of Substitution. Now we're going to have MRT, the marginal rate of transformation, which is equal to minus pc over pp. Or the slope of the budget constraint, OK? That is the marginal rate of transformation.

Now this class is not alchemy. We are not literally transforming pizza into cookies. That would be kind of cool, but we're not doing that. That's somewhere else at MIT, OK? But it's effectively doing the same thing.

What we're doing is, given that we have a fixed amount of money and given that we're going to spend it all, the more you spend on pizza, the less you spend on cookies. So you're effectively transforming pizza into cookies and vice versa because you're going to spend all your money. You've got to spend it on something. So, the more you spend on one, the less you get of another.

So, through the budget constraint, we are effectively transforming one good to the other. By having more of one, we're getting less of the other. So that's the sense in which we call it the marginal rate of transportation-- of transformation.

So, basically, this comes back to the key concept we talked about in the very first lecture, opportunity cost. The opportunity cost of a slice of pizza is two cookies. Remember, opportunity cost is the value of the next best alternative, OK? The opportunity cost is the next best alternative.

Well, here you only have two alternatives, pizza and cookies. So the opportunity cost of a slice of pizza is two cookies. And that's the sense in which you're transforming pizza into cookies or cookies into pizza, OK?

Now this seems kind of abstract, but let's actually think of an organization which has taken this principle to heart to develop the best method of weight loss in America, which is Weight Watchers, OK, Weight Watchers. Now it turns out that dieting is

super hard and basically doesn't work, OK? There's a large literature, which says that people go on diets all the time. Then they stop them, and they gain the weight back. OK, dieting is incredibly hard and basically doesn't work, OK?

But a much more successful approach has been established by Weight Watchers. It's not the only approach, but it's been proven much more successful, OK? And, essentially, what does Weight Watchers do? They set up a budget constraint and ask you to follow it.

So, for example, they essentially assign point values to every good you might consume. You go on the website, and everything in the world you might want to eat has a point value. They then ask, well, what weight are you today? What's your age and gender? That stuff matters for weight loss. And what weight do you want achieve?

And they say, if you want to achieve a weight loss of x over y days, then you've got to limit yourself to z points. So, essentially, your goal is to lose weight. So we're going to give you the budget constraint. We're not going to tell you what to eat. That's why it's better than dieting because, once again, Adam Smith was right. People like to have choices. They like to let choice drive things.

But we are going to tell you a total budget. So, for example, vegetables are like zero points. Snickers bars are like six points, et cetera. They have various point systems, OK?

So, for example, suppose your budget is 30 points, which would be pretty typical, OK? Suppose you go to McDonald's for lunch, and you get a number one. The number one at McDonald's is a Big Mac, which has 14 points, fries, which have 10 points, and a Coke, which has six points. That's 30 points, and it's only lunch, OK? You've blown your whole budget for the day on lunch.

Now you could just get depressed and say screw it. I'll just be fat. But, clearly, looking around the room, you guys have not made that choice. Or you could look at the budget constraint and say, well, what else can I get. Well, it turns out you can get a 10-piece nugget, which is 12 points, apple slices, which is one point, and a Diet Coke, which is zero points, for a total of only 13 points. Now you have 13 points and plenty of room for dinner.

Now, to be honest, anyone who tells you that second lunch is as good as that first lunch is a liar, OK? I'd much rather a Big Mac and fries and a Coke than nuggets and apple slice and Diet Coke. Give me a break. But I'd also much rather have dinner, OK?

So, basically, this lets you make the trade-off by imposing a budget constraint, by setting relative prices across goods. The points are like utils. They're not meaningful. They're only meaningful relatively. It lets you set relative prices across goods and then it lets you, essentially, optimize across those various-- across those various goods. So budget constraints, essentially, by setting up this marginal rate of transformation, can help with a lot of kind of decisions in life. OK, questions about that?

OK, now what happens if we shock the budget constraint? So we talked about constructing them. What about shocking the budget constraint? We're going to do a lot in this class of what we call comparative statics, which is, essentially, making changes in one thing or another and seeing what it does to the system. So let's talk about shocking the budget constraint.

Let's start first with a change in prices. Suppose the price of pizza goes from $12 up to $18. This is a really good slice of pizza, OK? Well, what happens to the budget constraint? Let's look at figure 3-2. Figure 3-2 shows what happens.

You have your original budget constraint BC1. The equation of that line is 12P plus 6C equals 72, OK? The price of pizza and the number of slices of pizza plus the price of cookies times the number of cookies equals 72.

Now the price of pizza has gone up. What that's done is that has pivoted inward your budget constraint to BC2. It has flattened the budget constraint because the slope, remember, is the ratio of the price of cookies to the price of pizza, right? That's a ratio.

Well, that ratio has just fallen. It used to be a 1/2. Now it's a 1/3. Negative 1/2-- well, it used to be a half. Now it's a 1/3. So the slope has fallen from negative 1/2 to negative 1/3.

So what's happened is you can still have as many cookies as you had before. The y-intercept has not changed, but you can have fewer slices of pizza. That's why it's a pivot because one price has not changed, only the other price. So it's a pivot inward.

The other thing here, you'll notice we have all these funny dots and stuff, OK? That represents what has happened to what we call your opportunity set, your opportunity set, which is an important concept, OK? Your opportunity set is the set of choices available to you given your income and market prices, the set of choices available to you given your income and market prices.

So your opportunity set initially was the black dots plus the red dots. Now your opportunity set has shrunk. Your opportunity set is now just the black dots.

Given your income, you can now get less stuff, same amount of cookies, but less pizza. And you are worse off. Your opportunity set has shrunk. Your opportunity set-- even though your parents are still sending you the same check, you are worse off because you can now buy less pizza with it, OK? So that's what happens to the opportunity set when a price changes.

And, likewise, you should show to yourself the same thing will happen when the price of cookies change. In that case, you'll get an increase in the steepness of the budget constraint, OK? But your opportunity set will still-- your opportunity set will still shrink, OK? Now what about-- yeah?

AUDIENCE: Don't we not care about all the dots below the line, though, because we're assuming we're spending all the money?

JONATHAN GRUBER: Well, that's a good point, and we're going to come back to that. We haven't-- we assume they're spending all their money, but it's just a way of representing. You could think of the line being lower as the same thing.

We care about-- we just care about the area because it represents the set, but you're right. You could just focus on the line and say the line is everywhere lower. So they're worse off. That's another way to look at it. But we like to think about as a set. It comes in handy later for various reasons, OK? But that's a good question.

Now let's ask about a second thing. What if your income goes up? What if prices are

back to 12 and 6, but your parents decide to send you more money? Suppose your parents-- or send you less money.

It turns out you haven't been paying enough attention in 14.01. You're parents are mad. They're monitoring you. That's why we have the camera here. This goes directly to all your parents, OK? I'm sort of joking.

And so let's say parents cut your allowance to $60, OK? Well, what does that do? That's in figure 3-3. OK, in figure 3-3, the old budget constraint was that you get pizzas and cookies at a price of $6 and $12, and you could get them until you spend $72. Now you can only get them until you spend $60.

Now what we see is not a pivot in the budget constraint, but an inward shift in the budget constraint, because the relative price of pizza and cookies has not changed. Therefore, the slope hasn't changed. OK, the slope is dictated solely-- you don't do anything to control the slope. The market controls the slope, OK?

But you and your family control the level, and the level has shrunk. So you're pivoting inwards, OK? And, once again, now, instead of being able to buy say 12 cookies and six pizzas, now you can only buy say 10 cookies and five pizzas. That's the most you can get, OK?

So, once again, your opportunity set has been restricted, but in a different kind of way through this pivot inward, OK? So that's how we sort of manipulate these budget constraints. And we're going to come back to that next lecture. That'll be important. Yeah?

AUDIENCE: So, in looking at the differences, can like an increase in the price of pizza or like a decrease in your budget-- is it more showing that like the change in slopes doesn't really affect you if you're like say buying more cookies than pizza? But like, in terms of if your budget as a whole decreases, then it affects you overall.

JONATHAN GRUBER: That's a great question, and we're going to actually answer that question next lecture very explicitly. So hold on to that question, and we'll talk about we're going to compare explicitly why income changes differ from price changes and what are the underlying mechanisms. Yeah?

AUDIENCE: How do you determine your marginal rate of transformation? How do determine your-- like say it wasn't just pizza and cookies. Like say it was more products. How would you determine that value?

JONATHAN GRUBER: Great, great question. So, as I said, we always are going to start with simplifying assumptions to make life easy. There's no reason that this couldn't be written in three dimensions. And you'd have relative marginal rates of transformation, rates at which you're willing to trade off various things.

So you could just extend the math in all dimensions. It wouldn't add any richness, and it'd just make your head spin. But the basic-- so all the basic ideas can come across with two goods, but it'd be the same mechanics with more goods, OK? You essentially, when we get to the constrained optimization, you'll essentially have more first-order conditions in your constrained optimization. That's the way to think about it.

OK, so let's-- actually, that's a great segue. Let's turn to the second part, which is how we use budget constraints and the utility function we learned about last time to actually describe how consumers make choices. So we're going to take utility.

Remember, I said last time consumers are going to maximize their utility subject to a budget constraint. Well, now we've taught you about utility. We've taught you about budget constraints. Let's put them together, OK? How to consume-- how do consumers put them together?

Well, graphically, the representation of preferences was our indifference curves. That represented people's indifference with further out indifference curves made people happy, right? That was last time.

So, essentially, what we're going to ask graphically is what is the highest indifference curve you can achieve given your budget, right? We know you want to be that highest indifference curve possible by more is better. So we're simply going to ask what is the highest indifference curve you can reach given your budget, OK?

So let's consider the same utility from last time. Utility is square root of P times C, OK? And let's consider the same budget we wrote down up here-- $72 income, $12 price of pizza, $6 price of cookies. And now let's ask where can you go with that. So

let's turn to figure 3-4 and do it graphically. We'll do it mathematically in a minute, OK?

So, in figure 3-4, you have our budget constraint, which runs from 6 pizzas to 12 cookies. That's the original budget constraint. And you have a series of indifference curves. And these indifference curves, I1, I2, I3, I4, they all come directly from this utility function.

So, simply, I've solved this utility function. I'll talk about the math in a little bit, and you'll do more math in section on Friday, OK? But, essentially, you can solve-- we'll show you-- you'll drive on Friday how you take this utility function and literally can draw the indifference curves from it, OK?

But, for now, take my word that these indifference curves represent this utility function. And what we see is that point D is the furthest out indifference curve you can achieve while still meeting your budget, while still meeting your budget constraint. And, therefore, we say that the optimum, graphically, is the tangency between your indifference curve and your budget constraint is the optimal constrained bundle.

You see how we brought-- last time, we talked about further out indifference curves make you happier. Today, we talked about the fact that you're limited by your budget. So we have the furthest indifference curve you can get to is going to be, definitionally, at the tangent of the indifference curve and the budget constraint.

And, once again, that gives you-- we realize we don't want to measure utils, but, just for mathematical, for mathematical purpose, that gives utility at the tangency of square root of 18, OK? At that point, you are choosing six cookies and three pizzas. That is the choice you are making. That is the best off you can get given your budget.

And, to see this, let's talk about some other points and why they're not better, OK? Let's talk about point A. Why isn't point A better? Why isn't it better to have two-- maybe you just-- maybe you like cookies a lot and don't like-- or like pizza a lot and don't like cookies that much. How can we say that point D is better than point A? Yeah?

AUDIENCE: Because point D is on a higher indifference curve.

JONATHAN GRUBER: It's on a higher indifference curve. So point D dominates point A because it's a higher indifference curve. Well, fine. Same person, by that logic, why not choose point E?

AUDIENCE: It's above the budget.

JONATHAN GRUBER: Yeah, you can't afford it. So the bottom line is you can see graphically why the tangency is the best you're going-- is the best you're going to do. OK, likewise, point C you wouldn't choose. Point C has the same slope. It has the same slope as point D.

In other words, the slope is minus 1/2 at point C. You've drew a line tangent to point C. The slope will be minus 1/2, just like it is at point D, but you wouldn't be spending all your money. So you wouldn't choose that point either. Yeah?

AUDIENCE: What if you have just three indifference curves so there is none that hit the tangent? Do you just go for one that's like the most tangent I guess?

JONATHAN GRUBER: We're going to come to-- we're going to-- well, first of all, we're not going to have discrete indifference. We could have lines, and the lines could end up-- you could end up lying along. You could end up lying along a budget constraint for example. Or you could have-- you could even have utility functions, which just touch a budget constraint at one extreme or another. And we'll talk about those cases. Yeah?

AUDIENCE: So [INAUDIBLE] utility function go through lines and the budget constraint, right?

JONATHAN GRUBER: Yeah.

AUDIENCE: Isn't this just Lagrange [INAUDIBLE]?

JONATHAN GRUBER: Well, let's come to the math then. OK, let's come to the mathematical derivation. So that's the graphic. So let's come to the math, OK?

Now, always a bit of a tightrope act when I'm doing math up here on the board, so bear with me, OK? But the key thing is the math of constraint optimization is all about the marginal decision. Remember, it's hard to say how many cookies you want. It's easier to say should I have the next cookie, OK? It's about constraint

optimization.

And what we want to ask is we essentially want to compare how do you feel about trading off pizzas versus cookies versus what will the market let you do in sort of trading off pizzas versus cookies. That is the optimum is going to occur when we set your marginal rate of substitution, which, remember, we defined as minus MUc over MUp, equal-- I'm going to get rid of this-- equal to your marginal rate of transformation, which we defined as minus pc over pp.

And this is the fundamental equation of consumer choice. If you understand this equation, you can solve virtually every consumer choice problem I'll give you, OK? That basically, at the optimum, the ratio of marginal utilities equals the ratio prices. That is the rate at which you want to trade off pizza for cookies is the rate at which the market will allow you to trade off pizza for cookies, OK?

Basically, it's saying the ratio of the benefits. Think of this as the benefits and this as the costs. Think of the MRS as the benefits. It's what you want. MRT is the costs. It's where you're constrained. You want to set the ratio of the benefits equal to the ratio of the costs, OK?

Now I find it actually easier to think of it this way. If you just rearrange terms, you can write it as MUc over pc equals MUp over p sub p. I like this way of writing it because I call this the bang for the buck equation. What this is saying, your marginal happiness per dollar should be equal.

This is sort of the happiness per dollar spent on cookies. This is the happiness per dollar spent on pizza. And you want those to be equal. You want the bang for the-- you want to put your next dollar where it's going to make you happiest, OK? And so, basically, think of that as your bang for your buck.

So, for example, suppose you were in a position where the MRS was greater than the MRT. You're in a position where the marginal utility of cookies-- and I'm getting rid the negatives. There's negative on both sides. So I'm just going to get rid of the negatives, OK?

The marginal utility of cookies over the marginal utility of pizza was greater than the price of cookies over the price of pizza, OK? That is the slope of the indifference

curve was greater than the slope of the budget constraint. This is the slope of the indifference curve. OK, this is slope of the indifference curve. This is the slope of the budget constraint.

In absolute value, the slope of the indifference curve is greater in absolute value than the slope of the budget constraint, OK? That would be true at points like point A, point A where you intersect-- where you basically intersect from above the budget constraint by the indifference curve. So a point like point A has a steeper slope of the indifference curve than does the budget constraint.

What that says is intuitively-- and, once again, I want you to understand the intuition-- the rate at which you are willing to give up, the rate at which you are willing to give up cookies for pizzas-- I'm sorry. Let me say it-- let me say it a better way. The marginal benefit to you of another cookie relative to another pizza is higher than what the market will charge you to turn pizza into cookies.

Let me say it again. The marginal benefit to you of another cookie, which is this-- this is how much more you want the next cookie relative to how much more you want the next pizza-- is greater than what the market is going to charge you to trade in your pizza for cookies. Therefore, you should trade in your pizza for cookies, OK?

So let's say this mathematically. At a point like A, point A, OK, you have your marginal utility for pizza is the derivative of the utility function with respect to the number of slices of pizza. It's the marginal utility. It's derivative of the utility function.

So it's dU dp, which is equal to 0.5 times C over square root of P times C, OK? And, at point A, at point A, we had two cookies and five pizzas. At point A, P was five. C was two. OK, that's true of point A.

So we can evaluate the marginal utility dU dp, which equals 0.5 times C over square root of P times C. So that's 1 over the square root of 10. That's the marginal utility of the next slice of pizza. The next slice of pizza makes you 1 over square root of 10 happy. Once again, that number is meaningless. So we only care about it in ratios.

So we need the ratio. So let's do the marginal utility of cookies. That's dU dC, which

is 0.5 times P over square root of P times C, which is 2.5 over the square root of 10, OK?

So the marginal utility of pizza is 1 over square root of 10. Marginal utility of cookies is 2.5 over the square root of 10. Therefore, your marginal rate of substitution is minus 2.5. Remember, marginal rate of substitution is MUc over MUp. So your marginal rate of substitution is minus 2.5.

What does that mean? Can anyone tell me what that means? Your marginal rate of substitution is 2.5. What does that mean? That is a meaningful concept. Utils are not, but that is. Yeah, say it loudly so we can hear.

AUDIENCE: You're willing to trade-- you're willing to trade two pizzas for one cookie.

JONATHAN GRUBER: You're willing to trade. Exactly, you're willing to give up 2.5 slices of pizza for one cookie. That's what that number means. And that is a meaningful number. That's not an ordinal. That's cardinal. We can use that. You are willing to give up 2.5 slices of pizza to get one cookie.

What is the market asking you to give up? How much pizza do you have to give up to get one cookie? Half a slice. You are happy to give up 2 and 1/2 slices of pizza to get a cookie, but the market is saying we'll let you have a cookie for half a slice of pizza. So what should you do?

AUDIENCE: Trade.

JONATHAN GRUBER: Eat less pizza. Eat more cookies. That will unambiguously make you happier. And that's why you should move from point A towards point D. OK, that's the intuition, OK? You basically want to trade pizza for cookies until these things are equal.

Indeed, I'd like you to go home and do the same math starting at point B. If you do the same math starting at point B, you'll find the MRS is much below 1/2. That is, at that point, you are happy to give up tons of cookies to get pizza because, jeez, you've got 10 cookies and one slice of pizza. You'd give up tons of cookies to get pizza.

But the market says you only have to give up two cookies to get pizza. So you'll happily do it, and you move back towards point D. And that's sort of in a bundle sort

of the intuition and math and graphics of how we do constrained optimization. OK, that is hard and very important. Questions about that? Don't hesitate to ask.

OK, that is hard and very important. If you understand this, you're sort of done with consumer theory, OK? This is sort of the core of what consumer theory is all about. It's all about this balancing act. The whole course is fundamentally all about one equation, which is marginal benefits equals marginal costs, OK? Everything we do is going to be about weighing the marginal benefit of an activity against its marginal costs.

If we take the next step, what's the benefit? And what's the cost? Well, here the marginal benefit is the MRS. The marginal cost is the MRT. We want to set them equal. And this sort of example I hope explained why, OK?

So that is how we think about constrained choice. Now I want apply it. I want to apply it by looking at the example of food stamps, OK? Now food stamps are not actually called food stamps anymore. When I was a kid, they were called food stamps. It's basically a program the government has that provides money for individuals to buy food if they're low income.

Essentially, we have in the US what's called the poverty line. And I'll talk a lot more about this at the end of the class, but the poverty line is essentially a measure of what's a minimum level of resources you need to live in America. The poverty line for an individual is about $14,000. OK, for a family of four, it's about $28,000.

How you feel about that number obviously is going depend on where you're from. If you're from Boston, you'll say that's insane. If you're from some rural part of the country, you think, yeah, that's poor, but manageable. OK, we'll talk later about the poverty line, what's good and bad about it.

But, in any case, if you're below the poverty line in America, roughly speaking, you get help with buying food. And that comes through a program we now call SNAP. It used to be called food stamps. I've got to update my notes. Supplemental Nutrition-- I don't know. I know the N is for nutrition.

OK, so, basically, what the SNAP program does is it gives you a debit card. If you qualify on income grounds, you get a debit card, and that debit card can be used to

buy food and food only, OK? So you essentially get a debit card from the government that you can use to buy food if you're poor enough. And they give you sort of a fixed amount every month, and that amount can be used to purchase food.

So here's the question. Why go through this rigmarole? Why not just give people cash? This fancy thing, if we want to give poor people money, why don't you just give them money? And we're going to-- I don't want the answer yet, OK? What I want to do is show you graphically how we think about the trade-off, and then we'll come to the answer. So hold your thoughts.

So let's actually graph how we think about food stamps. Let's go to figure 3-5A. And let's start with a cash transfer. So here's the setup. Imagine people start with an income of $5,000. That's super poor, OK? $5,000 is their whole family income for the year, OK?

And let's say all they can spend it on is food or shelter. Remember, as this gentleman pointed out, in life, there's more than two goods, but it makes it a lot easier to have two goods. So imagine this case. Your two goods are food and shelter. And, actually, quite frankly, if you're that poor, that probably is the only two goods you have to-- you can worry about at that level of income. OK, it's food and shelter.

So you $5,000 to devote to food and shelter. So you have some original budget line, which is labeled there original budget line, that runs from 5,000 in food to 5,000 in shelter. And then you can have some of in between, some along the way, OK?

Now let's say we give someone $500 in cash. Obviously, this graph is not to scale, OK? It looks like you're doubling his income, but it's only $500. This just sort of makes it easier, a not to scale graph. Let's say we give someone-- we say to them, look, you're poor. We're going to give you $500 in cash.

Well, now all we've done is shift out your budget constraint from 5,000 to 5,500. OK, we've shifted out your budget constraint from 5,000 to 5,500. What does that do to your choices?

Well, consider two different types of people. Person y, OK, they used to be on indifference curve I0. They used to spend almost all their income on food and not a

lot on shelter. They were probably homeless, OK? So they spent all their money on food and were basically homeless.

Now what do they do? Well, they spend a little more on food and a lot more on shelter. Maybe now they get-- you know, $400 still doesn't buy you much shelter. They spend a little more, OK? Maybe, a night a week, they can get shelter, OK?

So, basically, that's what they do. That's their constrained optimization. We're not saying it's right or wrong. This is not normative economics. It's positive. The positive thing is, given their utility function, they move from point y1 to y2.

Now imagine someone like individual x. They're different. Their tastes are such that they don't need to eat. They just want to have shelter.

So they're up at point x1 initially. And you give them that $500, and they spend just a little bit more of it on food and even more of it on shelter. They just love their shelter, OK? And they're just super-- they're super Weight Watchers. They don't eat, OK?

So, basically, they move from x1 to x2. Once again, not normative right or wrong, it's just these are feasible choices people could make given the opportunity set with which they're faced. And that's what happens when you give them the $500 in cash. Questions about what I did here on this graph alone? Yeah?

AUDIENCE: Like, even if like you gave them money specifically for food, couldn't they then just reallocate their other money?

JONATHAN GRUBER: OK, that's a good point. We'll come back to that. That's time out if you're not a sports fan. OK, so we will come back to that. And, in fact-- OK, but do people understand what the cash transfer is, how it works?

OK, now let's go to SNAP. And let's say, with SNAP, instead of giving them $500, we'll give them the debit card. Instead of handing them a $500 check, we give them a debit card with $500 on it that can only be used on food. How does this affect their budget constraint?

Now we see where budget constraints start to get interesting and fun and the kind of challenges you're going to face in this course in drawing budget constraints. The

original budget constraint continues to be the original budget line running from 5,000 to 5,000. The new budget constraint is this kinked line that runs from 5,000 on the y-axis to the point x2 at 5,000 on the y-axis.

So it starts at 5,000 on the y-axis, 0 on the x-axis. There's a flat line that goes to 5,000 on the y-axis, 500 on the x-axis. And then it slopes down parallel to the original budget constraint to 5,500. Can someone explain to me why that's the new budget constraint? Yeah?

AUDIENCE: You can't spend a negative amount. So you can't spend like negative amounts of your non-food-stamp money on food.

JONATHAN GRUBER: Exactly, you have-- we are forcing you to spend at least $500. Compared to cash, where you can do whatever the hell you want, we are forcing you to spend $500 of your money on food. Coming to the question back there, it doesn't have to be a specifically labeled 500. It can be any 500. But we're forcing you to spend at least $500 on food.

Well, what does that do to your choices? Well, for person y, it makes no difference whether they get cash or whether they get food stamps. Now the person, light blue shirt, turquoise shirt, asked that question. Why does it make no difference? Yeah? Why does it-- whatever, greenish, I don't know, yeah, you. Why does it make no difference for person y if I give him food stamps or cash?

AUDIENCE: He's already spending a lot of his money on food. So any money he gets he can just reallocate differently so he can spend some of the money he would have used on food on shelter.

JONATHAN GRUBER: Exactly, he can just reallocate his money, OK? That's exactly right. So, for person y, there's no difference. Look, they're already spending, what, $4,900 on food. You give him a thing labeled $500 for food. It's not going to affect their life. They'll just take 500. They'll just spend-- they'll just treat it as $500 more in cash. They're indifferent. So nothing affects them.

But what about person x? Well, person x, remember, the dashed portion of this budget constraint is from the old cash example. And the dotted indifference curve is what they would have chosen with cash.

Remember, person x with cash would have chosen to still spend less than $500 on food. Even when you gave them $500, they still only spent $300 on food. So we are forcing them to not be on their preferred budget constraint. Rather, we're forcing them down to point x2, which is they'll spend the minimum they can on food, but the minimum is $500, OK? We are forcing them down to point x2.

Now why do I say forcing them? Why do I know for sure they are being forced, that they're less happy at x2 than they would have been when they gave them the cash? How do I know that for sure? Yeah?

AUDIENCE: They're at a lower indifference curve.

JONATHAN GRUBER: Exactly. Think of it this way. The fundamental-- one of the important things is people always get to the point that makes them happiest, OK? We call it the robustness of economic equilibria. People get to the point that makes them happiest.

They want-- they always before had the choice of spending $500 on food, and they chose not to. Therefore, if you force them to spend $500 on food, they must be less happy, OK? Think of it that way. They always could have spent $500 on food. They didn't. Therefore, in forcing them, you're making them less happy, OK?

So they are worse off, OK? They are forced to spend. They'd rather spend some of that money and find a nicer place to live, but we're not letting them. We're making them buy food, OK?

Do people-- I don't want-- I just want to know if people understand the graphics here and the conclusions I drew. OK, now why? Why are we doing this? Why would you-- they're better off with cash. Why would we force them to have food? Yeah?

AUDIENCE: Say because what makes-- what puts people on the highest indifference is just what makes them happiest, but not necessarily what makes them like live the longest or like have the best health So, perhaps, like if you never spend money on food, and then you die, that would be really bad.

JONATHAN GRUBER: OK, but, basically, what you're saying is you know better than the guy. Let me-- I'm not accusing you. I'm just saying, look, if people knew best, maybe they'd like to just like have a nice house and die, OK? If people knew best, then there'd be no reason

to do this.

The reason to do this is because we think they don't know best. So, for example, let's change the label on the y-axis, just a small change. Let's cross out shelter and write cocaine.

[LAUGHTER]

OK? Well, in that case, maybe we don't feel so bad about forcing the guy to buy food instead of cocaine, OK? In other words, this a program which might make sense if we are paternalistic. Now we're getting into normative economics, paternalistic. If we think that people won't necessarily make the right decisions for themselves, then it may be worth actually making them worse off because they're not worse off. Their perceived benefits are worse, but they don't know what they're doing, OK?

Now you can see why-- I hope you can sort of immediately see why this concept makes economists a little nervous because why do we know what they want better than they do, OK? So it makes people a little bit nervous, economists a little bit nervous, and a lot of people a little bit nervous to say, gee, maybe they're just happier doing cocaine. And how do we know that that's the wrong way for them to spend their resources? Yeah?

AUDIENCE: Well, like can't you look at it from the perspective of like this is taxpayer money, right? So then aren't you also just factoring in how the taxpayer wants to spend their money and then their indifference curve and all their information?

JONATHAN GRUBER: That's a very good point. Now but there's sort of two points there. First of all, if the taxpayers' goal is to help poor people, then why shouldn't you make them as happy as possible, right? If tax-- why am I giving money to this poor guy? Because I'm sad his poor.

But, what you're saying, I'm not actually that sad he's poor. I'm sad he's not eating. If you're really just sad he's poor, then you should give him money. If what you're sad about is, gee, I don't like how he's living-- I don't like his-- I'm sad he can't have better food to eat, sad at the place he lives. Then you're starting to impose your preferences, but let's be important. That's imposing your preferences. Yeah?

AUDIENCE: I feel like the indifference curve only goes for happiness or like contentedness, but,

really, the point of SNAP isn't really with contentedness or happiness, but rather like what would be to a more sustainable life.

JONATHAN GRUBER: Well, that's a related point of the taxpayer. If the taxpayer cares about, look, we want a healthy populace that's going to live a long time and be productive and pay taxes, then that would be a reason to do this. But, once again, I want to emphasize, OK, this is paternalism. If you really just care what makes people happiest, you should give them cash, OK?

So that raises two questions, OK? First of all, first question-- yeah?

AUDIENCE: So how about like negative [INAUDIBLE]. Because, for example, if we pump a lot of money-- if we allow people to spend a lot on shelter, that's not really going to help people. It would just make the real estate developers rich. And say the amount of shelter is kind of fixed, but like the amount of food that eaten [INAUDIBLE]. So, if we let people spend more money on food--

JONATHAN GRUBER: Yeah, yeah, so, basically, that's a great question. And, in general, we're going to-- I'm going to answer a lot of those questions with the same cheat this semester, which is we're going to assume the markets are perfectly functioning. So there's no-- you're imposing sort of a market failure. If there's no market-- once there's market failures, all bets are off. But, with no market failure and no paternalism, you'd want to give them cash.

So this raises an important question. Do food stamps actually increase food purchases? First of all, there's two reasons why they might not. Reason one is everybody could be like y.

x is sort of a silly case, right? You're going to die if you eat that little. And food stamps aren't that much. They're maybe like $3,000 a year. Everybody is going spend $3,000 on food.

So the first issue is the first reason why food stamps may not matter is that, in fact, everybody is spending at least that amount. Everybody is like y, and nobody is like x. What's another reason why it might not matter? What's a way people could get around food stamps? Yeah?

AUDIENCE: Buy food with food stamps and sell it.

JONATHAN GRUBER: Yeah, they could set up a black market where they, essentially, say, look, I only want $2,000 of food. The government is making it worth $3,000. I'll buy my extra $1,000 of food, and I'll sell it to people who do want it. And I'll end up still eating $2,000 worth of food.

So we actually want to know do food stamps actually increase food consumption in practice. Are they making a difference? Well, actually, we've run an experiment on this, OK?

We're going to talk in this class a lot about empirical results in economics. This class is mostly going to be a theoretical class. That is we'll talk about models and ideas. But we're also-- since, basically, I'm an empirical economist, we're going to talk about empirical economics, which is results and testing the theories we develop.

Empirical economics, here's a great example of empirical economics is we set up a theoretical model. You always want to start with the theory, but the theory sometimes has predictions, which are uncertain. Here we have an uncertain prediction from theory about whether food stamps will affect food purchases or not. So let's test it.

And the way we test it is we actually have run food stamps cash out experiments where we literally take guys on food stamps and give them cash instead and watch what happens to their consumption before and after. It's a real randomized trial. We literally flip a coin. Heads, you keep your food stamps. Tails, we replace those food stamps with an equal amount of cash. Then we watch what happens.

What happens is that people spend about 15% less on food when you give them cash instead of food stamps. That is food stamps is forcing people to spend about 15% more on food than they would like to unconstrained by the cash. Yeah?

AUDIENCE: Yeah, this gets you into the behavior of [INAUDIBLE]. I remember reading an experiment like, if you have the price of gas go down, the actual like amount of money spent on gas is constant. And this might translate to food stamps because like food stamps are like explicitly on food.

JONATHAN Yeah, you know, that's a great question. And that's you're asking about richer

GRUBER: theory, richer theory. And I'm telling you that I'm going to give you the empirical evidence. So, whatever the theory is, the empirical evidence tells you what happens. And there's different explanations for why.

So the empirical evidence is that, basically, the price of our paternalism is 15%, OK? We are making people, effectively, 15% worse off. We're making them spend 15% more food than they want to. So is it worth it?

Well, actually, the evidence is starting to pour in that it might not be worth it because there's starting to be a lot of experiments where we're giving people just cash, especially in developing countries. In developing countries, the answer seems to be just giving people cash makes them better off, that actually, especially in developing countries, people use the cash in productive ways.

So, for example, they have a series of evaluation programs where they've given people cash, mostly in developing countries, in Africa in particular, some in the US. And they find that people spend relatively little of that on drugs and alcohol, but they actually tend to spend it productively.

And, in fact, they found, in developing countries, this often provides valuable resources for individuals to start businesses. So they ran experiment Uganda where a nonprofit company randomly offered a group of women $150, which is huge relative to their income. That's 50% to 100% of annual income in Uganda, $150.

And what they found was, after two months-- after 18 months, these women had used that money to start businesses. And that actually raised their earnings. That actually effectively doubled their earnings. From that one injection of cash, it led them to actually double their annual earnings, OK? So that leads one to think that maybe we should stop being paternalistic and just give cash.

Unfortunately, if you're a reader of policy websites like I am, the best one of which is vox.com-- it's a great website-- they had an article just the other day pointing out how they actually followed these women up nine years later. And, nine years later, the effect had totally gone away. So the story isn't quite necessarily positive, but it's not negative. They're not worse off, but it looks like, at least what in the short run made them better off, well, that effect fades over time.

But the bottom line is, at this point, I think the evidence is sort of probably in favor of being less paternalistic and just giving people cash, but that runs into a lot of difficulties in terms of our concerns about how people will spend it. So let me stop there. We will come back on Monday, and we'll talk about how we actually go from this stuff to the demand curves we started the class with.