EEP100: Lecture 7 (Sep 17, 2009)

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If you haven't heard already, we're passing around the homework. They are due next week in class, at the start of class. They also are online if you need to get a few more copies to pass along to you friends and family.

Does anybody else need this constrained optimization example? The printout? Come and get, or take it. Anybody else? Hands? I'm not bringing them to class again. I think they're on the website.

Any open questions from anybody? Like, "Oh I didn't get that."

I know there's some thing you didn't get. Notice that 1-6 is revisiting some stuff from the last lecture. But any other stuff that's maybe not on that list that you have a question about?

[Inaudible]

Yeah, so here's what happening with the videos. Because of our amateur production quality, although we have very high-qualified staff, they are not suitable for the Berkeley main channel. So, they're getting pushed into the community Berkeley channel, which is good because then it'll still be the best quality production we can get. And that transition from one channel to the other should be happening in the next day or two.

As soon as I figure out what's going on, I'll send you an e-mail. And then the videos will be posted. The mp3s of lectures, which the exception of last lecture (which of course the batteries ran out in the middle of)…and this is like…every possible thing that could go wrong is going wrong, but that's because we're not professional. So the mp3s are basically up-to-date as far as I can tell, so you can go for a jog and listen to me. When we get the videos up, it'll be there.

People who sent me auditions for the transcriptions: thank you very much. I've got four or five of them that I'm going to look at and compare. And then I'll e-mail you back and say, "Let's make a deal."

So that will be kind of cool because then we'll have words flowing along with the video. I sent you this e-mail on the blog post. So I want to go over this again in detail and get any questions from you because there is some confusion. The first person has already thrown their post over the transom. So you guys should be coming in with this stuff in the next couple of weeks. So it should be about a topic you care about. That's because you'll be more interested to write it. Don't pick something that you hate, okay? Pick something that you're interested in. And it's okay if it's not natural resources or environmental economics. I know that I said before that I want you to do that, but I want you to do something that you care about, but bring economic analysis to it.

[Does it have to be, like we read The Economic Naturalist, does it have to be in that style…like the question…s]

Something similar to it like…I've always wondered about this, and this is what I think. Or…I was looking at my roommate cutting her nails, and this is what I think.

[What if we…inaudible]

Yeah, that's also useful. Remember what I said, I had that Venn diagram that was markets and no-markets. Sometimes people might put economics on something that doesn't deserve economics. Or there's a more appropriate explanation.

[Like somebody's just greedy, there's really no economic…]

Then you get into some crazy stuff. Because economists…they've analyzed marriage, they've analyzed divorce, they've analyzed strategic death around taxes…are your kids rotten kids or good kids…why is it economic to believe in God…you can bring economics to anything you want. Whether or not you're right or whether or not you can convince somebody is a different story.

So I don't want you to say, "That's completely wrong. Really, what matters are sunspots." If you wanted to do that, make sure that the economics is worth the explanation. But that's fine. All of you guys are going to go out there and say something, so…that's what this is all about. Not just learning, but also…remember that new ideas come from people that don't know the right ideas, so to speak.

So if you come up with some genius explanation I'd be happy to be the person that instigated that. On the posts on my blog I often reach the bottom line. And that means that after rambling for a couple hundred words, I want to get to a conclusion that somebody can take away as a lesson that I'm trying to convey in the post. So I want all of you to have "bottom line", colon, and one sentence that summarizes what you just said or what you just concluded in your analysis.

And it's almost like a technicality but make sure you have one. If you don't have one, I'll push it back to you and that could be bad if you're at the deadline, right? Because you'll miss the deadline. So have the words "bottom line" with a colon, and hopefully a sentence that makes sense. If it doesn't make sense, I'm sure the thousand or so people that read the blog might point that out to you. As well as your peers, right? And anonymous commenting is welcome on my blog. So don't worry about revealing who you are if you want to critique something. One hundred to 500 words, send it in plain text. I already got an attachment. Just put it in the body of the post. It's better if you don't have all the carriage returns in there because then I have to remove all the carriage returns.

[So we don't e-mail it to you…]

No, e-mail it to me in the text of the e-mail. "Dear David. POST. Bye". And every post, I'm going to link it to your e-mail address that you send to me. So if someone wants to reply to you, they will go to that e-mail address. So if you're worried about

stalkers, then set up a yahoo account.

[Images?]

Send me the url or send me the image as an attachment. They're due at 11:59pm. I'm not going to read or edit them. Your typos are going to go up live. So pay attention to that. If it's a huge typo, then I might change it…you know…like you get the wrong century or something like that. I'll make sure I shame you in terms of fixing that because every minute of my time spent on these posts is time that you didn't spend fixing it.

So it's zero points. Zero points if you do not do 2, 3, and 6. You must have an economic analysis. You must have a bottom line. And you must give it to me on time. Any other questions about the blog right now? I highly recommend that you write it up and give it to a friend to see if they like it or see if they understand your post.

Let's get into the discussion for lecture today. So first topic: Marginal Rate of Substitution versus Economic Rate of Substitution versus elasticity. So elasticity, as you are well and truly tired of hearing, is the change in quantity over the change in price adjusted for price and quantity.

This shape is known as a constant elasticity curve because even though the slope at point A and the slope at point B (this turn here) is different, when you adjust for P and Q, that will give you an elasticity that is constant for any point on this curve. That's elasticity. Now before, last lecture I was getting confused back and forth between marginal rate of substitution, so let's go back to marginal rate of substitution. Beer and chips. And the definition of marginal rate of substitution is essentially the change in chips over the change in beer. And it's actually…

It looks like a similar shape (A and B) but the marginal rate of substitution is the change in utility from beer given a change in beer over the change in utility from chips given a change in chips. Now, it's a negative number because in economics, we think of it as a tradeoff. You're going to give up some chips or give up some beer, and get the opposite. You give up some chips to get some beer, so it's a negative thing. One goes up and the other one goes down.

Now, at point A, notice that we're not adjusting for where you are. That's why the marginal rate of substitution, which is just the slope (just like it's just the slope over here). So the marginal rate of substitution is going to change. And it makes a lot sense when we were saying at point A, we were willing to give up a lot of beer for one more unit of chips. So that's…the marginal rate of substitution here is different than it is over here.

It's an intuitive idea. I'm not trying to torture you with the math. I'm just trying to clarify why I was looking at one thing over another versus…because although both of them refer to slopes, this one adjusts for where you are and this one does not. Okay? That's the difference.

Now there's the useful thing, which is the economic rate of substitution. And that, in a sense, is just the tradeoff between the two goods in terms of price. So if we have the price of beer is equal to 4, and the price of chips is equal to 2. Our budget, just for the sake of convenience, is 8. If the price of chips is 2, we can afford 4 bags of chips and no beer. If we spend all our money on beer, we can afford two beers. So the slope is going to be the reverse…the minus the price of chips over the price of beer, which is -½. And we get this really traditional math equation. Beer is equal to 2-½ chips. That's just a line.

But this is called the economic rate of substitution. You're substituting between one and another economically in terms of just going from a bundle of (2,0) down to (0,4).

[Does it matter if we switch like…Pc over Pb?]

No, it's just a question of what's on what axis. I'm just going slope—rise over run. Did I do that backwards?

[Isn't Pb over Pc?]

I wouldn't be surprised. Is that right? I don't care. Is that right? No. We go back.

Democracy of mathematics is a wonderful thing. Want to go with that? I tried to get it right, but I screw up. I try to rise over run, but I'm in fourth grade math.

[Why is it linear?]

Why is it linear? I just said it was linear. In terms of this thing here? This is linear because of the ratio of prices. The prices are not changing as you move around between this bundle. That's the main reason it's linear.

[I have a question about the marginal rate of substitution. So if the goods are perfect substitutes, then the marginal rate of substitution is 1?]

No, the ratio is the same no matter where you are on the line. So it's not always one. One implies one chips, one beer.

[So it's always the same ratio.]

Same ratio because it's linear. Now we have chips and beer, and this is actually an indifference curve; it's not a budget constraint.

[So the thing up there is actually an indifference curve.]

This is an indifference curve.

[And the marginal rate of substitution changes when I'm on the line. The only case it doesn't change is the perfect…]

On the perfect substitutes, yeah. Now that's actually a good point because it brings up 2 things. One of them is that optimization in economics is that we have the

marginal rate of substitution equal to the economic rate of substitution. What's going to happen if they're equal?

There's two things that matter in economics. When curves cross and when curves touch. Are they going to cross or are they going to touch when they're equal. Touch, right?

We're just going to combine this and that. And we're going to find that our budget constraint, here, is going to touch our indifference curve, here. That's the optimal point. That's the best we can do.

Let's look at a different version of this. Say that this is our budget constraint, and this is our indifference curve. Can we do better than this? Yes. This is Utility One. We can go over here to Utility Two. Utility Two is greater than Utility One. So we are happiest at Point A.

We can consume anywhere on this bundle, on this line here, because that's our budget constraint. We can buy a whole bunch of chips and zero beer, or we could buy a whole bunch of beer and no chips. But our happiest point is where we are on the highest indifference curve. Where we have the most utility. Does that make sense?

And we have the slope is equal to slope. So that's where we have the marginal rate of substitution is equal to economic rate of substitution. Or the ratios of utilities…(U prime B, U prime C, is equal to Pc over Pb) and they're both negative, so the negatives cancel out. So that's essentially what you're getting. When you're doing the calculus (the LaGrangian and stuff like that) that's what you're doing. You're setting these equal to each other. As calculus goes, when I wrote on this handout here, the reason that you set the First Order Conditions to zero, it's because in calculus, it's about curves. And we want to get to the highest point of utility. Let's say it this way. This is just a way of looking at it. The tradeoff between beer and chips: we can have a whole bunch of chips and no beer, and a whole bunch of beer and no chips. So we go back and forth. And we're going to end up (because of the way I specified preferences…you want to have a little bit of each) at an optimal point that is a balance between beer and chips. An optimal point is where the First Order Conditions are set equal to zero. You set them equal to zero. That's the calculus. So you set up a Langrangian. You take a derivative with respect to X, you take a derivative with respect to Y, you set them equal to zero because you want both of them to be optimal, and you solve them with respect to the budget constraint because you want to get the bundle that you're going to consume.

I can say it, but you guys are going to be doing it, and you're going to understand it, right? The idea is that there's tradeoffs. And the tradeoffs, when you're thinking in terms of utility, they have to be constrained by something because prices tell you what? Now this is where this matters. Say that I change the price of beer and chips. Say that I reverse it and I go from (4.2) to (2.4). So now I'm here, like this. Now can I consume this bundle A? No. Why can I not consume the Bundle A. Somebody?

Because it's outside my budget constraint. I can consume anything in this area here. Now it could be possible that I could be indifferent to this price change if I happen to be tangent here. Or, I might not be very happy. I might have to go to a lower indifference curve because this indifference curve actually isn't tangent. So I might be happier or I might be indifferent depending on the shapes of my indifference curve. And let's pound on that a little bit more. Does everybody have the same indifference curves?

[No]

When you go out to lunch with somebody does everybody order the same thing? It's like, "Yeah, I'll have that salad and extra sauce, but no pepper and a beer…"

People are different, right?

[So the indifference curve is your personal preference?]

In sense. It comes from your utility function, and your utility functions are your preferences for things.

[So the slope of your budget constraint is a ratio of your prices?]

The slope of your budget constraint is the ratio of your prices. So remember that when you have a set of prices, here is: you guys, and here is: me, and here is: Bill Gates. I don't have half the wealth of Bill Gates. But you say, this is the income you got, income that I got, and the income Bill got. But we all face the same prices, so the slope is the same. The budget constraint goes in and out depending on your income. Another question?

[Your preferences…are they influenced by the price? I mean, if your price changes, would the shape of your indifference curve change?]

We assume that they do not. This means that you do not believe in the power of "bling". Or advertisements. This is the debate. If you go get an MBA or you go into marketing school, they say, "We can change people's preferences." Suddenly, you need something that you never needed before. Because the Apple advertisement (someone's dancing) or Coca-Cola (people are happy) or whatever, right? It's true!

So for this class, and actually for most of the time, it makes sense that preferences are perfectly fixed. So if you change the budget constraint because your income changes or the price ratio changes, leave indifference curves intact.

So how do we write up this indifference curve problem scenario? Let's say that these are my indifference curves, and that's someone else's indifference curve. This is just representing the idea that this person has a different set of preferences than my set of preferences. So indifference curves of different people will cross all the time. I'll get to the Edgeworth Box thing in a minute. But your indifference curves are not supposed to cross. And that's actually an assumption. It's a mathematically convenient assumption that I'll get to in number four here. Which is not too far

away.

Let me get to that all at once. But you'll have two people, and one person might have a budget constraint here, and they'll consume here. And another person might have a budget constraint over here (sorry, same prices) and they will consume at a higher…

This is one line, this is U one A. Start again.

Okay, so budget constraint. Indifference curve. Same person, indifference curve, and they're tangent here. Another person, they have a different budget constraint. Same prices, so it's going to be parallel, so it's shifting out, but same preferences. So this is their preference. Turns out that this person only drinks beer. With a bag of chips every once in a while.

So you'll see someone consuming bundle A and someone consuming bundle B, even if they're both sitting over in Jupiter. Same prices, same choices on the menu, different preferences. And potentially, a different income constraint. In a sense, that's the way the world is. You go to the market, and there's 80 different types of yogurt. Because somebody else wants to buy that stuff. And if that doesn't happen, then of course the brand will go out of business. Is that helpful, in terms of these differences in clarifications?

Let's go onto the whole preference…how preferences math to utility math to demand math to outcome. And believe it or not that's all I really need to say. But I'll say a little bit more.

So this is the way that it works. Preferences are how you feel about things: I like cats, I like beer, whatever. And almost by definition, we cannot observe them. I cannot observe your preferences, or your preferences, or your preferences, right?

I can ask you a bunch of questions. And that will be…when you tell me your preferences…you'll tell me, "Oh That's my preference." You have stated preferences. That's the technical word: stated preferences. Now, if I say, "Do you like chips or beer more?" And you say, "Oh, I really love beer more and I have three beers for every bag of chips."

And then I go over to Jupiter and watch you have 2 beers and 1 chips. And I'm like, "What the hell is going on?" There's a difference between stated preferences and revealed preferences. So this is what you say, and this is what you do. Has anybody ever noticed an inconsistency between what people say and what they do? This is the conundrum.

So, first of all, we don't even know which is which, because some people will say, "Oh I really do believe this, and you believe that, and they go do the wrong thing." And they say, "Oh yeah, I should've done something different, but it turns out that the ketchup was on sale, so I bought more chips."

So here's the problem. It's hard to know what someone's preferences are unless you

take everything into context. The weather, whether they had a fight in the morning, how much the price of ketchup is. So preferences: it might seem like they're changing, or people being inconsistent, but you don't know what's going on in terms of all the things going on that you're trying to keep constant. Remember that whole constant thing that we throw out there as an assumption. I'm pointing this out because in economics, we assume that preferences are complete. If we go into a supermarket, you can tell me the exact order that you will buy things in terms of price schedule. Most people go into the supermarket, and they're like, "Whatever, I just have to get cornflakes." Or "Oo, that's on sale." Or "Oo, that's in someone's basket."

There's a problem that we assume that they're complete, but most people really have no idea. So this is an assumption, which is maybe a bit fragile. We also assume that they are transitive. That's an easy expression for math. A is preferred to B, and B is preferred to C. What do we assume in terms of A and C? But what happens is, often you'll do this. You'll say, oh yeah, what do you do? You do this, and this, but do you prefer A to C? No.

So this is horrible. This is called irrational if you have intransitive preferences. Unfortunately, a whole bunch of people do. We also assume that the preferences are continuous. That means that as we go from 2 to 3 to 4 to 4.5 to 5, that those preferences will remain in intact? Why do we assume that they're continuous? Math person? We use calculus a lot in economics, what is calculus about? Change of what? Change, slope, at a certain point?

So can you have a utility function that goes like this? There's no point in the middle here. Because calculus depends on curves—smooth curves. You can't have that. You can't have this. You can't take a derivative of that, because you'll run into the straight-line problem. So you'll assume that they're continuous because it makes it easier to do the math. Once again you have the world, and people are like, "No, actually…"

It's like the whole 6-pack versus case of beer phenomenon. "Oh my God, I've got to make a decision. Do I get a six pack of import, or do I get like a case of Keystone for half the price?"

So if it's not continuous, then the math breaks down. I'm pointing this out to you because these assumptions are made all the time, and they contradict reality.

So if you're sitting in class thinking, oh my god, I don't know why this is contradicting reality, you're still sane. But this how we talk about preferences in economics. Big assumptions, or some small assumptions.

Nonsatiated, remember that one? Now, they actually say locally. It's a question of 3 ice creams versus 3.2 ice creams. Not 3 ice creams versus 30 ice creams. But still, you're assuming local nonsatiation because that basically means that your utility is going to keep going like this. It's not going to hit a wall. Or that it's going to go like that. So locally nonsatiated means that you do always want more where you are

right now. And also we assume that preferences are convex. Convex is this shape that I drew between beer and chips. If I keep drawing, this is convex. This is concave. What is this implying with the tradeoff between beer and chips. What are you going to do? If that's optimal, here's your budget constraint.

You're going to consume one or the other. Either all beer or all chips. That actually is weird. We're not quite into that. So that's why we go for the convexity, which is… people like having a combination of things. Think of going to a Chinese restaurant with six or eight of your friends—everybody orders something and shares it off. Yes, you could have two bowls of rice if you want to, but usually you want to have some rice, some eggplant, and some chicken, or whatever.

And that's what convex preferences imply. This is a lot easier to understand in terms of making sense in terms of reality. This doesn't make so much sense. These other assumptions: completeness, transitivity, continuity, and nonsatiation are almost all based on the need to use calculus and math for describing preferences and taking derivatives.

Now, from preferences—there's a morbid thing called preferences out there. And we take all these assumptions for granted, and then we say okay, my utility is a function of beer and chips. A utility function is just a summary of all of your preferences, and one mathematical shorthand. Now this is actually a utility function. You can't take a derivative of it, but you do know that person gets utility from beer and chips. If you wanted to, you can say I have a utility that appears to be alpha chips to one minus alpha. Now I've got a functional form. Now you can take a derivative of it. Or I can say that it's equal to beer plus chips, right? What's this one? What does this mean between the preferences of these goods? What does that mean?

Ordinal? I'm not going to go with that. They're not complements.

Linear? True.

If I have one beer and one chips, or two beers and zero chips, they're substitutes—perfect substitutes. This is an easy example. These ones here are…remember this is what I was drawing the other day (these indifference curves here). And this one is this one. What's the third one that I was drawing? The Leontief thing? They're perfect complements. What does this look like?

The "min" of either of those: the set of B, C. So these are different functional forms to describe our preferences. If I put a 2 in front of B, do I like beer more or less than chips? The other less. More, right?

If I have 1 beer, I get 2 utils of happiness. If I have 1 chips I get 1 util of happiness. They're perfect substitutes. Am I going to consume all beer or all chips?

[All beer]

With one caveat I forgot to add. What was the caveat? The price. The price matters.

If the price of beer is equal to 2 times the price of chips, then we'll probably consume identical bundles. So, let's relate these for a second. Remember this is economic rate of substitution, this is marginal rate of substitution, this is an indifference curve, this is an optimal bundle given those Cobb-Douglas preferences. What is the optimal bundle for linear? Here's my budget constraint, here's my indifference curve. Where am I going to consume? At the intersection? Can I get to a higher indifference curve? So if I go to a higher indifference curve, where am I going to consume? All beer, all the time, right?

I'm going to do it with two different shades of chalk. So this is my budget constraint, here's my indifference curve. I'm going to go to this indifference curve. Because I can do better. I can still consume this bundle here. That's known as a corner solution. In the corner.

Now where am I going to consume with these perfect complements? There's my budget constraint. Do I consume here? No? Does it matter? Right, so I make no difference between this point and this point. But can I get to a higher indifference curve? Yes? Something like this, maybe? Right? I'll just consume until my money's exhausted. So what you're going to do is you're going to get to the highest possible utility to the highest indifference curve you can subject to your budget constraint.

[Why would you be indifferent between the spot that's inside your budget constraint and…]

Because these are perfect complements. This is the left shoes, right shoes type of thing. So if I have two left shoes and two right shoes, I'm just as happy if I have two left shoes and four right shoes. You might as well throw those away. They don't even help. So that's the tradeoff between these things. Our utility function describes our preferences and we can do that with pure math. We don't have to have numbers because (here's the thing that's really important). What are we measuring in utility? What we're measuring is utils, right? What the hell are utils? It doesn't matter.

So all we assume is that more is better. The more happy you are, the better off you are. And literally, if you actually are an emo-goth, and you actually like being in a bad mood, then more "bad mood" is better, right? So that's okay. We could actually encompass those preferences for feeling bad in a utility function.

The worse I feel, the better I feel. Okay, good. We can do that in economics. Everything will fit in there. But we don't know what that means in terms of numbers. We just know that utility (U1, U2, U3), we just know that we're happier to be, or we prefer to be, on an indifference curve of U3 than we do on 2, than we do on one. More is better. That's essentially where it comes from.

[And all these curves are called…]

They're all called indifference curves, yeah. And indifference refers to the indifference between two goods that were portraying. The utility function in reality…the utility function for David is equal to the function of beer, wine, travel…

there's as many things in here as possible because we assume that I have complete preferences. I can specify not only how much I like something, but how much I like it relative to anything else in the world, at any given time. And that all goes into this utility function. And all of you have got a utility function.

And on the chalkboard, we're just going to say, "let's just do two goods" but usually what happens in order to escape the beer and chips analogy is we just go, let's do beer and then all other goods that exist, right? Okay, that is simple; we took care of that problem. So we just narrowed the world down into to goods called beer and everything else.

[What about people who don't spend all of their income. And I don't mean people who put some into savings. I mean people who hoard all their money underneath their mattress and then they die, and then it's just lost.]

So, that's one of those reality conflicting with economics problems. But I think, on the one hand, if you put it in your mattress, you might think of that as a security blanket, you might not plan to die when you do die, but the biggest explanation is that you do save money now to spend it later. Including later as a multiple generations model—save money now to give it to your kids.

You can give me 15 cappucinos today, or you can give me 1 cappaucino a day for 15 days, and then I'm a much happier person. So that's where the future comes in. and remember, also that spending money doesn't always give you utility. You might not spend money and just sit on a park bench, and be perfectly happy with that. That's spending time. So that can go into your utility function as also.

[So is that part of the income constraint?]

It could be. Because we're using this letter M for budget constraint or income, right? Well if this M depends on how much time we work, now we start to endogenize M. We're assuming right now that M is just a fixed number. At the moment, yeah. Just a pile of money.

[Student question inaudible]

If you think money today (this is Popeye and Wendy, right?)… I'll gladly give you two hamburgers tomorrow, if you give me one today. But then we never get to tomorrow, so Wendy's always happy, right? But if you are someone who prefers to consume today rather than consume tomorrow, are you going to have savings? No. In fact, you're going to have a heavy duty balance on your credit card, right? Because you borrow from tomorrow in order to spend today.

So we're going to get to (later on the in the course) time discounts and stuff like that, but that's what's going on there.

[If you have utility just by having money, would your M have a variable on it?]

M we're going to use just as money. If you get utility from having money, then you

would have something else in here, not M, called savings. And that's kind of like… you have a preference for savings because that's a form of security. Or it's a form of benchmarking so you can say, "I have more money than you." Something like that.

This M functions as a way of constraining our consumption. So if you want to, you can call this…let's call this M1 for money that you're going to spend. And there's another thing called M2 for money that you're going to save. Together, they are equal to M. So functionally, what you're talking about—saving makes you happy—so you want to put that in utility. But in terms of accounting, you have another thing called money that you're spending, because you want to consume things. And consuming time, consuming savings, consuming walks in the park. It's all consumption under economics. They all go into your utility function.

So from our preferences to utility, and from utility we're going to get a demand. The demand for the good depends on what? Price. That's the answer, right? Depends on the price. That's why when we draw a demand function; the only things on it are price and quantity. Demand is a function of price. Or quantity demanded, it's exactly the same thing. Notice that quantity is over here, inverse demand. P=1-2. Another demand function.

So when we talk about preferences, we're talking about bundles of goods. Combinations. Utility. How happy I am to have a certain good—a bicycle, or a sunset. When it comes to demand, then we are going to include prices. We're going to include money. We're going to include the constraints of budget. That's why we talk about the marginal rate of substitution and the economic rate of substitution meeting.

Chips and beer, and very similarly, over here. This line here (economic rate of substitution) is not the same as this line here. But it is bringing up a similar thing. Our preferences that are on here (This is this same thing as utility) and economic is from prices. And here we have a demand function, which relates how much we want given our preferences based on the price. So in a sense, this will go to this, right?

And then we're actually going to witness, in the market, this. Q* of an individual. How much does somebody consume? Well, I can see that. That's their stated preferences (or their revealed preferences). They consume this many of whatever these are (quantity of beer). So I see that at a price of three dollars, the consume two beers, and if we go backwards it's like oh, because there's a price tradeoff between beer and chips, or beer and all other goods, and that tradeoff is the difference in prices they are going to face. So they have a difference curve that is driven by the preferences between all other goods, which is expressed in the utility function, which come from wherever the hell preferences come from.

You see how that comes backwards and forwards? How these come…the system of relationships kind of come from preferences to outcomes in the marketplace? Does anybody not see it? You're all so happy looking.

An example…you have your preferences for these items, they are related to each

other in terms of utility and function, then you go into the market and you look at the prices that you see, and then you choose how much you consume. That's what's going on. Hopefully, it makes a lot of sense. It's easy for economics to get complicated; that's why I want you see this linear relationship from one to the other.

[The quantity demanded is the quantity sold, or the quantity wanted?]

Quantity wanted is infinite because it's nonsatiation. It's just sold…

[I mean, for example, at a given price. So, let's say…]

The price is 3, I buy 2.

[So let's say the price is 3, I want to buy 2, but actually because the government has put a price cap on it, there's a shortage and I can't buy two. I can only buy one because…]

So the price is not three. It's different.

[No, but the price is three because the government says that the price is three.]

Well the price of beer on the moon is 12, but I can't get to the moon to buy it, right? So we're talking about a transaction that you can complete at a price that you do face. So the price of three…maybe the price of beer is one, and plus two dollars of waiting around to get your beer. Or it's three, but when you put that government price floor on it to account, it actually ends up being five, and then you go from two to one.

[So is one the quantity demanded?]

Given what you just said to me, yes.

[So it's not the quantity that I really want at that price, it's the quantity that I could possibly get at that price.]

So this is the relationship between prices that you face, whether or not it's the cash price or time price or any other price and the quantity you demand. That's the relationship there.

[So even if the nominal price is three, my actual price is five, which is why I can only get one.]

Right. So these are real prices here, not the advertised price. Not the price that's happening in Malaysia, but the real price that you face.

That's a good question, but this is meant to convey real prices. So you're going to make a real choice based on a real price. Here's another way of looking at that. That was a demand function, right? Let's do you scenario here. There's my demand function, here's my supply, in a free market, or whatever regular market. And then the government says, we're going to put a tax on here. So now the price is higher. And you consume less, just like that. So the supply curve is actually where it's going

on. As a consumer, you just look at what's out there, and you decide not to consume.

[What about the example of if there's a sale and they have to advertise 5 hamburgers for 50 cents each. And everybody runs out to get 10 burgers. And when I see that I say, okay I want to buy ten at that price. And I get there, and they just don't have 10 left. They only have 2 left.]

So this is your supply curve. It stops. Preferences are not changing. Preferences are intact.

[How does utility equal to x? How do derive x from utility?]

You're going to do that on your homework. What's the difference between…what do you add in order to get demand? What do you add? Prices, right? So how does utility get to demand? You add prices, and you find out what your demand is given a set of prices.

So when you do this Lagrangian stuff and you solve for X*, your optimal, then you're actually going to see how much you're going to demand given a price. This is definitely homework stuff.

[Inaudible student question]

In this particular example, that horizontal line is the supply curve. So supply curves, they start low and they go high, and sometimes they go flat. That is not the world's only supply curve that I just drew. Usually it's like this, sometime's it's like that, it's okay. Any other questions? Rolling right along…

We're only going I get to production today I can see. Alright, that's fine.

We're trying to learn here, not lecture. Alright, but we're going to get to Edgesworth Box, which is so fun. You guys didn't get any of the fun last time, I really felt like I was robbing you.

Okay, so how to optimize pins. Remember you've got utility function (this is directly applicable to your homework). You've got utility function; you've got the price, and you've got the budget, right?

If you've got perfect substitutes, my utility function between good X and Y is going to look like what? Give me an example. Alright, let's do X and Y. What's it going to look like? What's the math on this side of the equation going to look like?

Yes, nice. X + Y.

If it's perfect complements, what's it going to look like? Minimum of X, X and Y. and if they're in between, it's going to look like what? Right, I'm just going to say what you just said.

So these are the derivatives; when you do the LaGrangian, what you're going to do is…you've got your utility function. LaGrangian is equal to utility minus the thing…

Price of X, X + Price of Y, Y minus M. That's your LaGrangian. Can you use the LaGrangian method to solve this? Yes? Because why? What are you going to do? Not exactly take the natural log. Your first step (that's the hint…to take the natural log). The derivative with respect to X, the derivative with respect to Y, the derivative with respect to lambda. Come on frat people, help me out here.

So you take your derivatives, so calculus works, yay!

What do we do with that one? Can I take the derivative of a minimum set? No. How would you solve that. Let's say that my preferences are the minimum. 2X, Y. Price of X equals 3, price of Y equals 5. And M is equal to 15.

If I spend all my money on X, how many can I buy?

[One]

These are my bundles here, right? Five, zero. I spend all my money on Y, zero, three. So you can see that there's going to be some…this is an SAT question. Fill in the blank. Do you see that there's going to be a tradeoff between these two? Okay good. If I buy 4 of X, spend 12, can I buy a Y? 3 of X, spend 9, can I buy a Y? 2 of X, I spend 6. 1, I can spend 3, I can buy 2.

My minimum of 2x and Y…*[writes numbers on the board]*

Which bundle am I going to consume? My utility from the bundle (10,0) is the minimum of these two numbers. The minimum of 10 and 0 is 0. Can I beat 0? Okay. What would I do? (2, 2) is the answer. Whatever you consume the least of, that's the utility of it. So if you consume zero, your utility is zero. So in some ways, you have to have at least something to compare to this argument. So you can have utility of one or two.

[So if you have (2,2) are you using all of the $15]

No. That's often why we say subject to the constraint, in this case especially. Where did I write this down? Y less than or equal to M. You can only spend equal to what you have, and you can spend less. But there's no additional utilities in that leftover.

[If you wanted to graph that, what would it look like on the graph?]

Perfect exercise for homework. So look at this, though. What's your utility here? Zero. What's your utility here? [*Zero*.] What's your utility here? *One.*

So how many indifference curves will be mapped by those outcomes? 3, right?

One indifference curve called "zero", one curve called "one", and the other one called "two". So yes, you can map that out.

The minimum of the two numbers. This is a different kind of utility function. It might seem like it's just academic whatever. But it is quite helpful when you want to think about stuff besides left shoes and right shoes.

[Are the three indifference curves just flat lines? Or vertical lines]

They look like Ls, remember?

Other questions?

[How do you get the numbers…]

These numbers? This is what I can afford, this is figuring out my utility. So this would be like a transformation, and this is actually utility.

[Can we only use whole numbers…because in that case if you don't spend all your money then you'll try reach the corner then. But now we're still cutting the L shape?]

I'm going to leave this discrete. No fractions. Just integers. I'm going to force you to use integers. Because you can't buy half a beer. Or ¾ of .62 of a pizza.

[How did you get the values of utility?]

Under these? I took the minimum. What I said was, these are the quantities; this was my utility mapping. The minimum of 2x and y. It's not just (X,Y). So (2,5) is 10. The minimum of those two, right? So that's my utility attribution to each of those goods. This is physical and this is how I feel about it. And my utility is the minimum of those two. The minimum of (10,0) is 0.

[How'd you get y again? I'm sorry…]

I spent all my money on X, the price of X is 3, right? This is what you need to do in terms of these calculations.

[Should you draw those indifference curves?]

If it's helpful to you, you should draw the indifference curves. If you get the answer right, I don't care what you do. Show your work. Other questions?

Now, Mr. Edgesworth. I just kind of threw that out there; I didn't realize how significant the Edgesworth Box was. I want to spend a little more time on it. The guy that came up with it, obviously Edgesworth, he was an intuitive kind of economist who worked about 120 years ago. But what the Edgesworth box demonstrates is it demonstrates how this kind of world works without having to worry about how this works. So price doesn't necessarily matter. And I'll show you what that means.

Okay so let's set up this world, and I'm going to say we've got Mr. A and Mr. B. We've got two goods. We've got beer and we've got chips. The total quantity of beer in the world is 5. The total quantity of chips in the world is 10. Mr. A and Mr. B…

Indifference curves that I just showed you. Did they have the same preferences or different preferences? Different preferences, good.

Now I'm going to start off each of these guys with a bundle. Let's just say A has 2 beers and 6 chips. And Mr. B has 3 beers and 4 chips. I'm going to try and actually make this match.

Mr. A has 2 beers and 6 chips. What I'm trying to show on these indifference curves is that if you sit there and you offer…if you take away one beer from Mr. A, do you have to give him a lot, or many, or a few chips compared to Mr. B? Many, right? This is meant to be just 1.

So Mr. A, relatively speaking, prefers chips to beer compared to Mr. B. That's just kind of something you can observe from the shape of the indifference curves. Now, what the Edgesworth box does is it combines the preferences of these two folks, and we have this box is 5 units tall because we have beer. And here's chips. Now if I wanted to put Mr. A (this is the origin of A), I can draw indifference curves. Very similar. Do you see that?

And Mr. B's indifference curves…I've got to put him up here; I've got to flip this thing upside down, so that this axis is beer and the other axis is chips. So I'm going to draw this like I would upside down, like that. Just rotate it like that. Can you see how that happened?

Here's the part that gets interesting. The distribution of goods in this world is as follows. Mr. A's got 2 beers and 6 chips. Remember that this is increasing chips, and this is increasing beer, and likewise. Now where does Mr. A start in terms in terms of the endowment of goods Mr. A has…or rather, given this axis at (6,2). 6 chips and 2 beers. That's where Mr. A begins. Where does Mr. B begin?

Where's that going to be? Same place, right? They start off right here, because all of the units are accounted for. We go down 3 and go over 4. So this is basically the starting distribution of wealth in the world. And let's just draw an indifference curve through there. I'm going to call it Ia and Ib. Does everybody see how these indifference curves are just extensions of general patterns of indifference curves? These are indifference curves for B. Does everybody see that? The shape is basically the same. And A, likewise.

So here's our question: first of all, does Mr. A want more beer or chips? Yes or no? Yes. More is better. Does Mr. B want more beer or chips? Yes. Now, can both of these people get better off by trading with each other? There's no prices, remember.

Where would the trade go to?

[In the eye]

In the eye. As in, this eye? The technical word that will work is the football, right? So in the football, we have a whole bunch of gains from trade possible. Because either those curves would be better off gaining the trades in the football, or the rugby ball, or the fishing hook, or whatever. So either of them would be better off. So if Mr. B is on the same difference curve here, and Mr. A gets to here, then A is

better off, and B is not worse off, so they would both be happy.

But look, if we did that, there's an even smaller…there's still a football here, it's smaller, but it's there. So where should these guys end up in terms of the mathematics of where they end up from trading with each other? They should touch? Where would they touch? What way should they touch? There's no area… okay…but what's the mathematics of where they touch? Tangent, right? Because in calculus, what's just happened? They're optimized and the marginal rate of substitution between Mr. A and Mr. B will be equal because they're tangent.

So this is going to be bundle zero, this will be bundle one. You go from bundle zero to bundle one, you're better off, and you can't trade anymore in terms of making each other better off or indifferent. The only thing you can do now is start hitting each other and stealing from each other. But in the world of voluntary beneficial trade, you will get from bundle zero to bundle one. And that's the end of trading. You start here and you traded until you got to here.

You could end up…could you end up till you got to another point besides here? Could you end up at a point inside the football? You could end up almost everywhere. We have no way of understanding where people will end up, okay? Psychologically, people will tend to want to inside more, but theoretically you could end up anywhere on the lines or in the middle there. It actually depends almost on the power of positions of people and that's where we put it. But all you need to know is that you'll end up somewhere in the middle. Now at that tangency, the marginal rates of substitutions are equal. There's no prices, but I think if you wanted to set a price, what would the price be? If you wanted to. If you were an outsider. You would say, you know what? I think I want to set a price now. What would you set the price at? Don't give me a number, what's the concept that you would use?

You would set a price, essentially, that is a straight line passing through that tangent point. Because that's what we're dealing with all the time, when we're doing the market. There's my indifference curve, there's the price, there's the optimal point. These guys are trading, and they arrive at an exchange rate, literally between the two goods. This is essentially the same thing as an exchange rate that we use the price. This price (remember I used the word endogenous?) is an endongenously determined price just because of the trading going on. And if it turns out that they end up at a different point in the bundle, then there'll be a different set of prices, but that's okay. All you should know is that where the exchange is is where they end up setting prices. Any questions on that?

Alright, I'm going to go quickly into production and certainly not go into all this stuff. That's the end of our first go around with our consumer theory. And this is going to blow your mind.

So producer theory we've been talking about the utility of the function of the bundle of x and y you consume. As an example, for Cobb-Douglas. X to the alpha, Y to the one minus alpha. Remember that important caveat, alpha is in the set (0,1)?

The producer theory, shocking. We use exactly the same format, terminology, and mathematics. It usually works just like it works with consumer theory. I'm sure that I'll get to all the places that it doesn't work. But this, K, is what? Capital. Labor…so essentially production is a function of your capital and your labor. If you feel like it, go ahead. Let's call it capital and all other inputs. That's fine, same game. It's the exact same thing.

Basically it says that if you have no capital, can you produce anything? No. If you have no labor, can you produce anything? Right. It's the same analysis. It's the same analogy. It's the same way of thinking. But we're just using it to produce other goods. Now let me ask you, do you see a parallel here?

Utility increases at a decreasing rate. Marginal utility is fine. Output increases at a decreasing rate because marginal production is falling. Because of…what's the expression? Diminishing returns. So now, because of diminishing returns to consumption, we're dealing with diminishing returns to input.

One of the most important things to input, and I'll stop on this sentence, is the entrepreneur who runs the business. The reason we don't have one company that does everything is because there's just not enough management talent to keep everything running along. Next week on production we'll keep rolling along. Have a great weekend, enjoy your homework.

Transcribed and checked for accuracy by Brynna Bunnag