

EEP100 Lecture 15 (Oct 20, 2009)

David Zetland

So Midterm. Did you guys have a good time; how did it go?

It was all right? Kind of like a normal midterm? Yeah? Wait and see?

Were the questions fair or unfair?

Fair.

Fair? I'm sure I'll hear about the unfair questions later when you get your grades back. Actually this is one of those...kind of those examples of a principle agent model. Because although I wrote the questions, the GSIs are grading the questions. So if you don't like the questions, I can say, "Oh, they graded it wrong." And they can point at me and say, "He wrote the wrong question."

And after awhile you'll give up and take your grade. So be prepared for that obfuscation. You will find that in most of life, especially in bureaucracies.

So I think we're a little bit on track to get the midterms back Thursday. Is that possible, or...? Maybe, maybe not? We don't know.

The midterms will come back, and when they do come back I'll go over the answers. There will obviously be a key posted, but we'll go over it briefly in class like we did for homeworks. The goods and the bads.

About the blog post...should we be worried if it doesn't show anything?

So blog posting...I am posting them a week at a time in one-week blocks.

And that's when the scores will...

Yeah, that's when the scores will show up also. There have been some people who have gotten zeroes. Either because they dropped the class or because they didn't turn it in, or because they turned it in late, unfortunately. But if you handed it in on the deadline, typos and all, you will get 10 points. I continue to be enthusiastic about the blogposts that I see going up. There's a variety in quality, let's say. And there's a lot of interesting remarks and discussions from people who are reading the blog.

Who's the one that wrote on arsenal? Is he here? Is that you? No. Who was it? There's a guy that wrote a long thing on arsenal and then someone said...see I get these kinds of things on e-mail and facebook, so I kind of post them back up, and basically someone says, "I don't know what you're talking about." And he's like, "Oh yeah, buddy?" And it was really funny. It was like...I like that response. And give and take is what blogging's all about. I just finished a book as my recreational reading on the history of blogging. And it was quite cool in the way that he discussed not just the evolution from stupid narcissistic people in the 90s, but also how blogging is having a bigger impact on

dialogue between people. So I encourage dialogue in my blog and I encourage you guys to participate. Most obviously with your own posts, right? So we'll see how that goes.

YouTube. I can't do anything about YouTube. I know you guys are watching YouTube videos all weekend, listening to this class all over again, but they'll be catching up at some point. As usual the mp3s are going up all time.

I am going to switch the order of the assignments. Your briefing 1 right now...it says homework 3 is due November 5. That is not going to happen because I am not going to hand it out before November 5. And briefing 1 is due November 17. I'm basically going to have the first briefing due on November 12. That's roughly like...3 or 4 weeks? A while. So you will get 2 weeks minimum to write briefing 1. I have to come up with a topic. It's not going to be easy. But you all will be doing it.

And I'll tell you more about how I want you to write that when I assign the topic. But that was good...briefing 1 is going to be due November 12, homework 3 will be due November 17, essentially because we're going to hand it out the day you get your briefing (turn in your briefing). Just so you know, for those people that are planning for November. Get nervous.

You also should be starting the Olson and Schelling books. I would suggest reading Olson first because we're going to be working on collective action problems sooner than we're working on Schelling's big picture. Schelling is just like this most amazing writer. He's the one that came up with...he's the one that's most famously associated with the idea of mutually assured destruction. But I think that game theorists like Randolf also had a hand in that. The idea is that if the United States and the Soviet Union both knew that they could destroy each other on a second strike in a nuclear war, and believe me you guys did not live through the cold war. Or you were born, but you weren't thinking about it. Thank god you didn't. It sucked. But it wasn't like I'd wake up in the morning and I'd die today because the Soviets are going to bomb us. But it was really upsetting to kind of have this literally evil empire (to use Ronald Reagan's expression). And they had similar expressions for us. Had this kind of massive, geopolitical opposition. The multilateral world that we live in now is a lot more confusing, but it's a lot more...it's not black and white. I think that's a bad thing.

So anyway, during the Cold War, we had a bunch of nuclear tipped missiles, they had a bunch of nuclear tipped missiles. And the whole idea of mutual assured destruction is that if I launched my missiles, and we, the United States, launches our missiles at the Soviet Union, that they would have enough missiles left even after a first strike to make a second strike. And to destroy us also. Right?

What that means is that if they attack, we would all die. And vice versa. If they attack, they would all die. So because we would all die, that's not even a zero sum game. That's a negative sum game. There's no point of attacking. So we didn't. So that theory, believe it or not, was attributed to economists in game theory. I think partially responsible for the reason we didn't all die. Although John Kennedy got a little bit close to blowing us all up. Or of course Jacklyn Kennedy got us close to blowing us up in the Cuban Missile Crisis. Because there are issues with communications.

And two guys holding guns next to each other...don't trust them. Too much testosterone. So anyway, that's Schelling. And he also is famous in some ways for the idea of a focal point. And a focal point is again, a concept that we covered. So let me just step back for a second.

Welcome to the second half of the course. We're going to be getting away from all these Lagrangians and indifference curves and all that stuff; that really, really is boring. But you really do need to know. And this is where the fun begins. This is what I was thinking this morning. The fun begins, the fun begins. Because we're going to be doing much more game theory economics. That's interactive economics...that's the whole idea of *Economics in One Lesson*, which is there are consequences to your actions, but if you think about the responses the other person...how they would respond to you. Remember the clip from *Princess Bride*. So it's kind of like *Princess Bride* economics that we're going to be doing second half of the semester.

And we won't have as many mathematical examples that get to a bottom line, and we have an answer and it's 12. Because the world is much more complicated than 12. But you will be able to work with much more realistic, interesting problems, and actually we probably won't reach a consensus or conclusion or a bottom line most of the time, but we'll be discussing them. And we'll be using analytical tools including things like marginal benefit, marginal cost. Stuff that obviously right now, you are masters of.

I have a question regarding what you sent...that blog about the econ...about the Nobel Prize and what these people are thinking...so what is...I only just started with the econ major, and I come from a totally different major, and I don't quite know what is the actual...among economists...the consensus of how you should think about economics. I mean...are the math geeks winning out or...because they're like oh...it's the political economists—what do they know, or...it's the environmental economists—what do they know?

That's a good question, and it's good for clarification. I don't know...who sent me the e-mail...you didn't send me the e-mail did you? Who sent me the e-mail? I quoted her back there, that was you? What's your name? Anna, right? Anna sent this e-mail saying, "Why am I reading all these young boys and their misogynistic comments on the Nobel Prize winners?"

And that is why in fact I sent that to you guys. So, unfortunately, I didn't have a long cover note. I did have a long ex-post explanation. Those young boys unfortunately are... they represent a large chunk of thinking among economists. These are of course fresh PhDs. They come from jobs, rumors, boards, something like that. So these are...I'm a post doc so like a couple years ago I was on the job market for economics to get professor positions. This job order is for people that are trying to get professor positions. So some of the comments on this board, I would say a good chunk of comments on this board, especially the stupider ones, are by either graduate students who are reading this board because they're interested in where they are going in their career, or they're on the job market.

Because they are checking this every day to see...oh MIT is hiring...or MIT is really looking for [inaudible] or whatever. So that whole board is dedicated to the job market for new PhDs. Now, given that audience, and also given the audience of recruiting professors who are actually...they call that the demand side. So the new PhDs, they're the supply side. And the demand side guys are professors who are on the hiring committees, who are reading this board to see what's going on. It's an open access anonymous board. So clearly, there could be some troll from sociology who's sitting there going, "Oh, economists...math is all that matters, these guys suck." But, I think that actually represents the consensus of majority thought."

So these would be actually...

These would be actual professors. These would be actual professors.

...just came out of Universities across the country.

This could be me. I think, fortunately, for you, it is not. The reason that I sent that along (as I mentioned in the ex-post apology) is that this is more of a sociology of economics. And the reason that I thought it was so interesting was because, as I mentioned in my blog post, and in the notes I said to you guys last Tuesday, Lynn Ostrom is the shit. She is awesome. She has done the most amazing work on managing common property resources, which is the topic of this class. So I wanted you to know her work.

Now that thread, a good chunk of the first couple pages are just a whole bunch of ranting and raving about oh...you know...she's not even an economist, how did she get a Nobel Prize, she doesn't use any math, she didn't have a theorem named after her so she's not really good, I mean...the most...and I used the word autistic and I put a link in the blog post that I have going up this week about post-autistic economists.

These guys are expressing the conventional wisdom of economics, which is that if it's not mathematics, then it's not economics. And they are so wrong, okay? So basically in some ways I am telling you guys that these are the less-enlightened folks in economics. And in some ways, less-enlightened folks are directly, or indirectly responsible for the collapse...or...well...slow down. That we're now experiencing. Because of the way their mathematical theories led to an overextension in the marketplaces. Too much...the bubbles. The various bubbles in the stock market bubble and the housing market. It may not make much sense to you right now, but in the future, if you're thinking more and more as economists, you'll see that there is a battle going on between people that are wanting to think of people as rational autobots, and people who want to think of people as social beasts that are doing things for a lot of different reasons. And their collective action is very difficult to understand because they come from very different sets of incentives. And that battle has been the one that I've been trying to convey to you. Unfortunately, you don't necessarily have a counterexample to consider. As you read economic textbooks, and as you read economic opinion pieces, and as you hear lectures, and as you go on in your life, you think...I know something about economics. I want you to at least know that there are not just debates in economics, but there are different ways of looking at the world. There's no monolithic debate. And as I said in the first

couple days of class...I care that you take stuff out of this class, and you can use it for the rest of your life.

This is a toolkit...it's an economic toolkit. There's an anthropological toolkit, psychological toolkit, whatever. And you go out there and this helps you make better decisions in your life. And it helps you achieve your goals as a student, and as a human, I guess, which are not students, clearly. Then I will have done my job. And if you go to upper division, and you know how to do Lagrangian, great. But in the end, that's really trivial compared to using this stuff to make your life better. To make better decisions. Or, as I read this morning, the introduction to the textbook...the guy who wrote *The Marginal Revolution*, just so you can become better citizens. So you, more than anybody, will have something to say about tax policy or trade policy or welfare policy or even the cap and trade policy.

Because you're going to say, "I'm doing economics of environmental policy." And you're parents are going to say great, teach me. That's the good news. Or the bad news, I'm not quite sure. But you should be able to take that power and that soap box and use it to spread, hopefully, better information, better ideas to help people think about this stuff instead of...we're all going to hell...or instead of...we can have cheap energy and have less carbon at the same time.

You have to be able to point at the inconsistencies of this perspective for people in a fairly measured way because people are essentially emotional about a lot of topics. I'm hoping that you'll bring less emotion and more analysis to the topic.

This job board unfortunately a lot of people who have been trained in pure mathematical economics have been told that mathematical economics is the best thing out there, and it's the only thing that counts. And if you don't publish in a major journal, then you're not an economist. So Paul Krugman, by the way, has been run down and run down and run down by people in the profession because he merely write a column in the New York Times. He is merely the most famous economist out there, but academic economists, some of them, and graduate students, some of them, don't like Paul Krugman because he's famous and doesn't publish in journals that they think is important.

But unfortunately he probably has, for them, or fortunately for us, he has a bigger impact because he's contributing to the public policy debate. That's...I'm a little Krugman. A very little, little bit of Krugman because I have a blog, right? My idea is to interact with policy makers about water. And that's why my Monday morning post was essentially... explicitly pointing out what this politician said on campus the other day.

It's going to make matters worse in California as far as water is concerned. And I had a big fight back and forth with Michael Hanneman who's like a triple chancellor professor on this campus. He's like...he is like this god among professors, but I don't give a shit, I'm going to argue with him about stuff. It's about the debate. It's about arguing. I don't care who you are; I care about what you say. And so Lynn Ostrom has made a major contribution by helping us understand how to manage common pool resources. And these guys are like...well...show me a mathematical model for that. Well who gives a shit about the mathematical model?

She actually is doing something in terms of the forest is still there, and the community is still getting wealthier. And when her stuff is not happening, the forest gets cut down and poor people die. That's what really matters as far as I'm concerned. A mathematical model does not matter in that circumstance.

So that's what's going on in a sense that it's a debate. Now what's going on in terms of mathematics and the rise of mathematics. I just heard a podcast, and basically I'm reading a biography. I'm doing too many things. I'm reading a biography of Joseph Schumpeter, and he...you know Adam Smith back in the day, 1776, he's the Mr. Political Economy. And all along the way, you've got Smith, and even Marshall...if you ever get into economics you absolutely must get into the history of economic thought, or read *The Worldly Philosophers*. If you really care about economics, *The Worldly Philosophers* is a great book because it's a biography that tells us about who these economists are, and their theories put into context. Marshall was famous for saying...do the math, take the analysis that you learned from the math, write that in common words, throw away the math.

Marshall was...if it doesn't relate to the reality, the math is not useful. But once you understand reality better because of math (and that's why we do it) then throw away the math because all we care about is understanding reality, not math. What happened is... you had Marshall come along...1920 was the last edition of his textbook, and then in World War II you had...not even Morgenstern...it wasn't called Game Theory...it wasn't even...do you remember?

So Morgenstern wrote...oh crap...I'm just going to call it "Game Theory math book". That came out during World War II. At the same time Keynes is out there, at the same time Hayek wrote...at the same time Schumpeter writes *Socialism, Capitalism, and Democracy*. Big, heavy, philosophical, very interesting, very real world books. The game theory math guys came out and said, "Well, let's just think about this as a game. Assume that you have a person. And the person has one dimension. He's a flat person. And the person cares about one object. We're going to call it X. And it interacts with another person with the object Y. And then we have the summation, blah blah blah."

Then they started doing all this math. And that is very sexy for people that are good at math. And what happened is all these people failed at math PhD programs (I'm not kidding) went and did economics because it was easier. Because we didn't even know how to do math compared to mathematicians.

So what happened is...after World War II and the rise of mathematics, mostly driven by...aw crap...who's the guy who...he wrote the theory of...the economic analysis...he has like 50 editions of his textbook. It starts with an S...he's 90 years old now. I can't remember. I'm like dying on names. I'm horrible at names.

So this guy...so that's the rise of mathematics. It's based on game theory, Von Neumann Morgenstern, John Nash, who is the...you know...The Beautiful Mind...in the movie A Beautiful Mind, John Nash goes crazy trying to understand the entire world of math. Important lesson, right? It was not taken by other people.

Then there was the rise of this textbook...I can't remember...I have this stupid thing on my shelf...as an example of what not to do...but this other guy has the textbook, which is at 20 editions. He's at MIT, Harvard, anyway...a whole bunch of math.

In the 50s, and the 60s...remember it was at the exact same time as the whole war... and that was the space race, and so science was on the ascendant, right? So we would use math to save the world. But we...well we did get the man on the moon...but we got too much economics into math, in the 70s, one of the biggest disasters in economics happened, which was the so-called...I'm just doing this off the top of my head...there was an example between the relationship between inflation rate and unemployment. Okay? There's supposed to be an inverse relationship. It's called the Philip's Curve. And the idea was as inflation rate would go up, unemployment would go down.

So we'll just have a little more...we have a choice. We could have...actually the Philip's Curve is based on a historical observation...that there was an inverse relationship between these two things.

And so the economists said, "Hey, look, that's what happened."

And then all the...some central banker said, "Oh, good, let's let inflation happen so we have full employment."

But we didn't have full employment. We ended up having what's called "stagflation". Which means unemployment, high unemployment, and high inflation, right?

This stagflation word is being thrown around right now, based on our economy, right? So this was completely wrong, and this is one of the examples of pure math applied to economics. And there was...basically the wheels of mathematical economics started falling off in the 80s. And that was because of the rise of experimental economics basically showing that people are not rational according to stuff that I'll talk about later today in terms of playing games, and if their not rational, then your whole model falls apart because you're assuming that they are.

And if you're assuming that they are, then you can do...remember the point I'm talking about...satiating? Remember satiation? You consume as much, as much as possible? Well people don't satiate. Then you're not able to do a simple mathematical formula to figure out how much they're going to consume.

And if you can't figure that out, then your whole mathematical model falls apart. But mathematicians hate that, right? So the push back started happening in the 80s and 90s, and I would say that math is not even close to being on the ascendant, right? Math is on the decline, in a sense.

And the whole Nobel Prize this year was part of that. In terms of mathematical economics. But thing is that all the professors out there, all the academic journals, all the textbooks, are still written by mathematical economists, or dominated by mathematical economists. And because of that, if you want to get hired, or you want to get tenure, or you want to get a book published, or you want to get an article published, these guys still get to decide. They're called gatekeepers.

And as it has been said in many contexts, the pace the scientific revolution is on a generational pace. That means that the old guard essentially has to die before new ideas can come along. It's essentially that way. People are very, very invested in what they think is right, and they will block attempts to show that they are wrong until they die.

Samuelson is the name of this economist, who is pretty damn famous. He won the second Nobel Prize. And he wrote something like...*Economic Analysis* or something like that...or principles...or *Fundamentals of Economic Analysis*, and it's all, all math. And people are like, "Holy cow."

Ironically, Schumpeter, who is the guy who talked about forces of creative destruction, business cycles, and all these kinds of loosey-goosey stuff...Samuelson was his student. But Schumpeter was like agnostic. He was like, "You got ideas? Go ahead."

So that's kind of more than you wanted to know about the answer to that question. But it's this kind of struggle, in a sense. You can kind of call this the struggle for the soul of economics, or the struggle for relevancy, actually, I think...more important.

If it's irrelevant, then who cares. Even worse than philosophy. Because we actually pretend to be relevant. So the philosophers don't pretend. Like...hey...we're just talking. But economists are like, "Listen to us." But if you listen to us, and then you have this problem (you know...we destroy the economy) then no one wants to listen to you, right?

So that is an issue. And that's ongoing. So there's still more feedback on the Nobel Prize. It means a lot to economists because of these debates over ideology, and it means something in terms of what we mean when we say economics. And the reason that I'm getting into all this background is because you're in a class of economics. I'm not going to go do this to somebody on the quad, and I think you guys should know what's going on. And that's that. Any other questions?

With the rain, are we over the drought?

Yes, we're over the drought. I'm going to shut down the blog; I think that water management is going to be fine because it rained.

I just mean like...maybe the reservoir would have a little bit more

The reservoir added one foot, right? That's like 200 people though. So I actually posted this when I was in DC last year, and it was raining in DC, and there was a drought in California, and I was thinking...you know...politicians in DC, when it's raining, they do not care about water issues, because clearly there's enough water. It's falling out of the sky.

It was really interesting that...notice when somebody gets on the news...did you hear the story about the insurance company that turned down the fat baby for being obese? Because the baby was like 4 months old, and the insurance companies were like, "Oh, you weigh 14 pounds, you're at the 99th percentile...you're obese as a baby." John Stewart just took these guys apart. And so we're going to deny you coverage. And this is

actually...this is course material. This could be on your test. Pay attention. So watch the Daily Show for your homework.

So the point was not this ridiculous story about a baby who's being breast-fed and turned down for obesity. The point that was funny was the baby was the son (or daughter...I don't know what it was)...was the baby of a news anchor for a TV show. So guess what? They put the picture of the baby on the TV show, the one anchor turns to the other anchor and says...how does it feel to not have insurance?

I mean...massive publicity. And what did the insurance company do? Of course they insured the baby. They're not stupid, right? But on the other hand, you have to ask yourself—holy cow, what if I don't work as a news anchor on a TV show, right?

You really have to worry about people that get a lot of attention because they're the rusty hinge that makes all the noise, and there are people that don't.

And pay attention...I told you when the protests...go block a parking spot of the chancellor? You will get cheaper fees if the chancellor can't park, right? Justice has nothing do with it. It just has to do with...“oh my god, my parking space is blocked, give them whatever they want”, right?

That's how politics tends to work. And I've got a post this morning on the jobs in the valley—this big debate on the impact of water cutbacks on agricultural jobs. It's been a very emotional debate. John Kennedy went down there and did his little circus act, and the thing is that politicians are like, “Oh my god, that guy lost his job!”

This is actually really important. That guy...farm worker, agricultural worker, steel worker, auto worker...that guy...that human face...lost his job.

So this guy loses his job, and earlier in the news...remember that guy Joe the Plumber? Who here gives a shit about Joe the Plumber? He's like the most famous plumber in the United States, and you know he wasn't even legal, right?

So Joe the Plumber or whoever loses his job. Suddenly you have Joe the Plumber Save the Job bill. And think about the politics of this stuff.

Say that you defend Joe the Plumber. Let's say he's a steel worker. This is an important debate. You defend the steel workers because they're very photogenic. Steel workers, coal miners, all these guys that...they show up, they bring some fish to the capital...you defend their jobs. What do you have to ask as an economist? In terms of a bill, a law that will defend their jobs. What's the first question you should ask? What's the cost. Where would the cost from?

Where's the cost of defending a steel worker job, for example? So you're spending money, right? Or there was actually...the way they did that is that they actually put the tariff up. That's the tariff on foreign, evil steel. From the Chinese or Mexicans who we like buying everything else from, but not steel. So we put the tariff up for steel; what's the consequence? Joe the Steel Worker keeps his job; what's the consequence? Give me

another consequence. What happens? China gets mad...could be a trade war...what else?

Pay more?

People pay more...which people?

Factories...

The consumers of steel. And then what else? This is like...go one more thing. There's one more thing. Besides the trade war, pissing off China, who else gets hurt from now unfair US competition? Unfair plus unfair equals fair? Not in trade.

How about steel producers?

Yeah, steel producers...so this is consumers, and then there's the other producers, who often are much, much poorer than the steel worker, who only makes \$45 an hour. And you look at Chinese coal mine conditions. I mean the number of Chinese workers that are dying in coalmines. Insane, right?

So look. You keep one job. And by the way, just the direct costs of these jobs are estimated at about 500,000 dollars a year? The cost of defending a job that costs \$55,000 a year is \$500,000 a year. I'm a big fan of just sending a check for \$50,000, and telling that guy to go away.

But unfortunately, politicians are just going to stand in front of the mine, or a steel worker, or steel plant, and say, "I saved this guy's job."

But those other 20 people out of work are... "I don't care about them." Right?

Yeah, we may not care about them if they're Chinese or they're Indonesian, or whatever. And we might care about them if they're American. But what if the Americans were now paying more for a car, paying more for a clean canteen bottle, or whatever? So the impact, when they talk about the impact; this is actually just cash.

There's other impact, plus plus, in terms of bad trade relations, the whole breakdown... trade ground can be partially attributed to George Bush's actions in this. Obama put a tariff on tires. Chinese tires. To protect what? American tires. Who gives a shit? You know? I don't care where my tires come from. I want cheap tires. Or I want cheap and environmental tires. Right? I don't care about that.

So the thing is that you clearly see in office that politicians will defend one job, and they don't talk about the other 15 jobs. And your job as an economist, in terms of valuing these policies, is to take the whole picture into perspective, and think about that thing called the social welfare function. Now if you feel like limiting your social welfare function to Americans, because they're valuable, and no one else is...what's that? God bless us, and no one else? Anybody see that film?

This guy, Chris Rock is running for president, right? He was running against some...he's like, "God bless America, and nobody else." Right? That was his...that's the subtext in a

lot of these speeches by politicians. And you know what? Don't care about the other people, fine. But care about the other Americans. And that's these guys that are screwed. And they'll be screwed if there's trade war.

So whenever somebody comes out and says they have a simple policy to make all of us better off, watch very carefully what happens. Okay? That was a rampage about something. What was that about? Math. No, not that far back.

It was about rain.

Rain, yes. The politicians claiming that the problem is solved. Yeah, they try to fix the problem in front of them, that's what I'm saying. And Schwarzenegger tried to lock the politicians into a room until they come up with some...solution to 50 years of problems. You have a weekend. Fix it up.

So political grand standing. I'm not a fan. Wow, any other questions?

So the problem is not over with the rain. We're going to continue to have problems pretty much for the rest of your life.

Isn't the rain problem due to the decreasing snow run off?

Partially, but the rain here is not. The snow level rose up to 9000 feet (the storm before this one) instead of being at 3 or 4000 feet, so whatever snowfall was rain, and then it ran off. So that...this year I'm calling for flooding in Sacramento because if they have El Nino rains, and it's not snow, then the Sacramento river will flood, and it will flood downtown Sacramento. And that'll be fun for them. For me. Not for them. But we'll wait and see. Sacramento has worse levies than New Orleans does. That's an interesting little fact.

Anything else? Other questions?

So let me talk about sunk cost. This is a confusing concept. And I was in Memphis last week. I was attending some lectures given by my host. And he was talking about sunk cost, and I can see the confusion that this problem creates. Not just for students, but also for me and for you and whatever. So let's look at the decision. And this is a timeline. Let's think of the decision of buying a ticket to a game. It's football season now, is that right?

So say there's a football game. Say it's a Cal somebody game. Cal Berkeley or Cal Stanford game.

So let's say that you have an expected utility of \$300 worth of utility from attending this game. And let's say that the ticket, because students deserve cheaper tickets, costs only \$50. Let's say for the sake of this example that this is how it works. You're sitting there right now, T is zero. You have to make a decision. This is how your procession to the game is going to occur.

You've got to decide if you're going to buy a ticket. It's going to cost \$50. You have to decide if you're going to take the day off and buy the ticket, because maybe you can sell

it to your friend for \$100. Later on you have to decide whether you're going to take the day off. And they'll say that it's \$200 in terms of opportunity costs. Foregone earnings, whatever, right?

Let's say after that you're going to make the decision to drive to the game. Let's say that takes \$20 of gas, etcetera. That's at Stanford. Now who's done the sums now. Is this a good decision in terms of economics cost/benefits analysis? What's the cost equal to? Benefit? \$300.

Let's say...so you're sitting there going...I'm going to buy the ticket. And now you're here. What costs are sunk costs now? The \$50, okay?

Now, the \$50 is sunk cost if you cannot resell that ticket. Let's say...like some tickets these days...it has your name on it. Because it's not transferrable. If it is a transferrable ticket, what's your sunk cost? Zero. You can just turn around and sell it to somebody else.

Let's assume that it is a sunk cost because it's in your name. And now you're looking forward because you're saying, "Look, I have a decision here. I can take the day off, and drive, and I'm going to have a cost of \$220, and I get the benefit of \$300."

I'm not considering the sunk cost anymore. Okay? That's what we mean by sunk cost. That money is gone. Okay?

\$220 versus \$300? Good deal. So you tell your boss: "I'm going to need the day off; schedule my shift for somebody else." Okay? That is now a what? Sunk cost. That money is gone.

And then you get a weather forecast, and Hurricane Schwarzenegger is coming to California. And there's a 50% chance that you're going to have no hurricane. You go to Stanford like normal. You pay \$20. \$20 versus \$300...that's a pretty good chance, right?

But if the hurricane comes, that's \$500 of aggravation to get there. Probably the game will be cancelled, but let's just assume for a second that it's not cancelled. Hurricane-proof stadium because Stanford has gold plated ceilings.

Now I'm going to bring up a concept called expected utility. Expected utility is essentially a utility that reflects risk. It reflects the probability of one thing versus another. The abbreviation...there's a lot of abbreviations. I'm just going to call it EU. Is there a better one than EU? But we'll call this expected utility. I will always call it expected utility...but this is kind of jargon.

So your expected utility at this point here with uncertainty...I'm sorry, with risk...I'm going to discriminate between the words risk and uncertainty. I'll get to that in a second.

But basically you have 300 utils of expected utility if you go to the game, right? Minus the cost of getting to the game, which is going to be 1/2 chance of a \$20 ride, plus a 1/2 chance of a \$500 hurricane. Now if you're a simple person and you believe in flipping

coins, you might flip a coin and say, "I flip a coin. Heads, there's going to be a hurricane. Tails, there's not going to be a hurricane."

But that doesn't mean that a hurricane will not necessarily be there; you're just flipping a coin. You don't change the course of a hurricane. So when you're sitting here right now thinking about what's going to happen with your game, you're going to be weighing the good news, bad news scenarios. So your expected utility is going to be 300 minus 10, plus 250...equals 40. So should you still be deciding to go to the game or not?

Yes. You have positive expected utility. This is probably all I'm going to say about expected utility, but it is going to come up in your future course work. But this is a perfectly decent example about what it means. But this is 10 days out before the game, and the forecast is not exact. So right now, you're going to the game. Your Facebook status: I'm going to the game. Who cares about Schwarzenegger. Hurricane Schwarzenegger, right?

But 7 days out, there's an updated in the weather forecast, and it says that the probability of the hurricane striking Stanford stadium is $\frac{2}{3}$. Everybody calculate what your expected utility is now. And write it down. And then show it to your neighbor. And then argue with your neighbor if you don't have the same answer.

$\frac{2}{3}$ chance of a hurricane landing.

Okay so...my expected utility is equal to what? Hold on, give me the whole thing. $\frac{1}{3}$ times 20, what does that equal? Negative what?

100?

120

120? Can we do some math here? $\frac{2}{3}$ of...that's a nice, even number. Let's call that seven, and 333. Let's call that 340 minus 40. Is that cool? Did I do my math right? Should you be going to that game?

No. It's like screw it. For me. So you see what I'm saying, right?

I don't understand why in the first example and the second one, it's $\frac{1}{3}$ 20 or $\frac{1}{2}$ 20? I mean, I know it's the numbers that tradeoff, but wouldn't you have to spend...if you go, you have to spend \$20, not $\frac{1}{2}$ of \$20.

Oh no, I'm throwing the 20 in as a cost of going without a hurricane.

But why the $\frac{1}{2}$?

Because it's a 50% chance the hurricane is coming?

And you wouldn't be going if the hurricane was coming?

The question now is what you expect to do.

But if you go, you pay \$20.

If you go, and there is no hurricane, you pay \$20. If you go, and there is a hurricane, you pay \$500.

And not 20?

Yeah, it's one situation or the other.

Oh, okay.

It's a bifurcation in terms of choices. There's a hurricane or not.

You're saying if there's a chance of a hurricane, you either completely not go...you wouldn't try and see if someone else could go?

Well you can't sell your tickets; you already assumed that away. But if there is a hurricane, and the value to you is \$300...say you wake up in the morning. And you have your \$300 to go to the game. \$500 of costs if you get there. What should I do?

You should not go.

I should not go. That is a completely different decision from your expected utility.

Your expected utility is based on not knowing what's going to happen. So you're saying...giving the odds of this versus the odds of that...you guys might think about that all the time. If I go to Berkeley for my undergraduate, then I'll probably get this much utility from that, and if I go to Stanford, I'll get that much utility. You're kind of making up numbers in your head anyway.

Or if I go to there...maybe I'll...there's a 50% chance I'll enjoy myself, 50% chance I'll hate it. We do this a lot unconsciously, so I want you to think about that.

Go ahead.

But what if you knew about the hurricane even before you bought the ticket? Like it seems like you're actually...even if you're in that situation, if you include the sunk costs, you are paying more. Like...does that...

You do not include the sunk costs. If you were going back to the start, and you were deciding to buy your ticket based on knowing that the hurricane could happen, then would you include the cost of the ticket in your calculation? Yes you would. It's not a sunk cost. So sunk costs have an explicit element of time in them, okay?

So once you pass a certain point, that cost is sunk, right? Essentially, because you spent the money. And...oh here's an example. You walk into a movie. This is a very...much more common example. You pay \$10, you walk into a movie, and the movie sucks. Who here has ever walked out of a movie that was just bad? Who has stayed to the end to get their money's worth? Right?

Okay look, you're not getting your money's worth; you spent your money. What you have to ask is if I could do something better or the next hour, or should I sit here and watch this crappy film?

So another example that's very famous (to me at least) is [inaudible] who wrote *The Marginal Revolution*. Basically, the guy's a genius. He reads a book a day. But what he does is if he doesn't like a book, he tosses it. I'm forty pages in, 200 pages in, I don't like where this is going. And he tosses it. On board. I've got something better to do, is what he thinks.

That is what...that book is a sunk cost. The \$20 to buy it, and the 2 hours to read 400 pages (the guy reads like a crazy machine). The hour...how much time it takes to read it...that is all sunk cost. My money's gone, my time is gone. But looking forward, I can spend more time reading this book, or I could go do something else. And as soon as the opportunity cost of doing something else is higher, then the value of reading that book based on what he has learned in reading it, he will make a decision whether or not to continue or just stay.

This happens to be the way a lot of people think about relationships. Right? I had all these great times with that person; what about tomorrow? Or the next day, right? Unless they marry for life, then it's a foregone conclusion, right?

Or you get your meal at the restaurant, and your meal sucks. Do you finish it to get your money's worth? Even though you might throw up? You go to the all you can eat bar at Sizzler. Do you eat the whole salad bar? You stop at some point.

Yeah, but isn't that something where...rationally, you would stop, but many people wouldn't.

They do not, right?

Even though they would hate it, but they still finish...

There's a debate over the rationality of that evolutionary psychology debate.

Is it like waiting in line for something? Don't you think that you've already waited for like an hour, even though there's thirty minutes left...sometimes people just walk away. But if you think about...the one-hour is already gone, so you really are only looking at 30 minutes.

Right, so some people get fed up. I'm not a very good waiter, right? But some people get fed up and they...but the thing to think about is...is it worth it to wait another half an hour?

The worst thing happened to me. I had a car that was breaking down, and it was like...I could sell the car for \$1500, and I can repair it for \$1200. So I was sitting there at that decision point...\$300 net benefit right? So then I fixed the car, and then I've got that \$300 net benefit. I couldn't sell it, and another problem developed.

So now the car is worth \$1400, so now I'm sitting there looking at...well actually here's what happened. My \$1300 was gone. Now it's worth \$1400, because I still haven't sold it, still haven't gotten that money. But now I have to spend another \$1000 to repair it.

Now I'm looking there going at \$1400 versus \$1000. I guess I should repair it again, right?

The lesson is you should just hand somebody a check for \$1000 or sell the car for \$400, right? And let somebody else take care of the repair job, and all the other ones that are going to happen after that. Probably that car is buried somewhere by now.

But anyway, it's important to kind of keep these things in mind, and there's actually very interesting revolutionary debate about sunk costs in a sense that putting in effort...we do give a lot of value to effort that we have put in to something. It's like...I put a lot of effort into this thing. And even though I know that it's a sunk cost, I should continue to put in effort because I've put in so much effort. And I'm not very clear about the evolutionary explanation. I can't remember exactly what they say. But it has made sense in our past to do that, often because additional effort would be repaid in the natural world, but maybe not in the human world. I think it was something like that. So just, you know, the hunter-gatherer time. But economists call it sunk cost fallacy. It's sunk cost fact. A lot of people do not think of sunk costs as sunk but it's an interesting thing to think about, and it can be helpful when you're sitting in a crappy movie. Let's say it that way. I think it's probably a good time to apply that idea. So that's more stuff on sunk cost fallacy.

I just don't understand the \$500? Isn't the cost...I still go to the game, like...when there's a hurricane?

So either...\$20 is the cost to get to the game if there is no hurricane, and \$500 is the cost to get to the game if there is a hurricane.

I will not go to the game if there is a hurricane?

If you know for sure, right? But this is a 50/50 chance. You didn't know for sure, right?

That's why it's called expected probability. Expected utility.

So the \$500 is expected cost?

That is the real cost if this should happen. Right? The expected cost is the probability of that happening times the...this is the formula that you want to write down, by the way.

It's going to be the probability of good times the cost of good plus the probability of bad times the cost of bad. That's the formula that you'll use for expected utility. That's what I'm talking about right now. So the \$500 is the cost of bad, but it only has, in this case, a 2/3 probability or 1/2 probability or whatever.

What's the 300 called?

That's the benefit full stop. Maybe you have some expected benefit. If Stanford is winning, and my expected benefit is 10, and if Berkeley is winning, my expected benefit is 100. You can do that too if you want to. But that's two sets of probabilities that I'm not caring about interacting with. So you can have that too.

Yes?

I had a question. If you were an actual firm, let's say people wanted to implement a program, but they wanted a program, but they don't actually apply it, would there be a cost for that?

So Google invests a lot of money in developing program or software product, or whatever...a widget. So they develop a widget, they invest a lot of money, and they look at it and say, should we roll that out, right?

So that basically...that development in the widget is sunk. And what they're doing is they're saying...that's sunk. Now going forward, how much money are we going to make in terms of...you know Google has indirect revenue model. But how are we going to make versus the cost of going forward? Now maybe we'll make zero dollars, and the cost is one staffer. Or maybe we'll make \$100 million and the cost is you know...\$200 million or bad publicity or whatever. So they're trying to quantify that question on a going forward basis.

So in their accounting sheet when they have...

It's not accounting. This is economics.

Yeah. But they don't actually consider it a cost when they write it down and enter it?

From an economic perspective, they will talk about sunk cost. From an accounting perspective, they talk about expenses. R&D, right? Tax deductible. This is where accounting and economics really start going in opposite directions.

Do we need to stop? Yeah. Stop the tape.

I'm going to stop a little early today so that you guys can do a survey evaluating me in this class.

Inaudible

Good, bad. Technical words.

We're going? Okay.

So that's some stuff on sunk costs. Let me see here...

I was gone last week while you guys were taking the midterm, so I gave a talk at Rhodes College. Has anybody heard of Rhodes College? Are you from Tennessee? Indiana. But in the neighborhood, right?

Rhodes College is a liberal arts school of about 2000 students in Memphis, and a colleague flew me out there to give a talk on sustainability. That'll be going up on my blog if you care. I'm not going to sit there and give you the talk again (thank god for everybody). But it'll be on my blog if you want to listen to it.

The only thing I wanted to note in terms of recycling that talk is I talked about the difference between natural resources and environmental goods, I talked about collective action problems, but I talked about this definition of sustainability. And this might be useful to keep on your bookcase, I guess. But here's the problem...there really isn't a good one. Everyone has their own. And as an economist...an economist might say, "Oh, sustainability is this. Equilibrium, sustainability...they're all the same idea, right?"

And as you know from the midterm, how often does this happen. Never, basically, right?

So the thing is that sustainability really implies some kind of (from an ecological or biological perspective) it implies some sort of staple with variation, population over time. A steady state is the idea. Now let's just say before humans showed up, nature had gotten into some type of steady state and evolution with shocks, like asteroids hitting the planet. And things were kind of going on, they're going on, and they're going on. Right?

And then we started to have impacts on that in terms of doing unsustainable things. Mining (most notably) fossil fuels to increase the amount of energy being used on the planet to a level much greater than the level being created, in a sense. Fossil fuels meaning oil and coal and things like that. So we change the amount of greenhouse gasses (it's the sexy thing right now) but we changed the amount of pollution, we changed the consumption of resources, we changed the population of fish, and the size of the forests, and all those things. We changed a lot of things out of where they were on a reasonably steady state, because humans have these kinds of impact on environments, right? We could go in, and of course a forest could be slowly growing over a millennia, and we can chop the whole thing down in a week, right?

That's a pretty heavy-duty hit in terms of the forest. So humans can have huge impacts; In terms of sustainability, it appears that we have done some pretty big damage to sustainability on this planet. We're still wrestling about what to do about it, and maybe we will for the rest of our lives, sure. But that's the concept I wanted to bring up in terms of just the way I think about sustainability, and when I talk about it in this class, it will be in that realm. So that's an observation that came out of that talk; I thought you might care to know. And if you really care about the topic, then you might want to listen to the talk. It's an mp3, usual.

Any questions about that?

Is there a difference between sustainability and subsistence?

Oh, sustainability and subsistence. Either there is, or there is not, right? So you could call it a subsistent economy. You can call it a sustainable economy. Someone might say Denmark has a sustainable economy. Because everybody rides bicycles around, and they have...they eat fish, and they don't kill all their fish, their lifestyles are healthy, and they have solar energy, and stuff like that. But you might not say that they're a subsistent economy because they eat lovely foods and watch TV. So subsistence tends to mean you're just above starvation in terms of your daily caloric inputs. That's the kind of subsistent economy. You're growing the food you need to eat. You might starve if that crop fails. That's more of a subsistence...that's where the word is used most often.

Is subsistent even sustainable? A subsistent economy might not even be sustainable because maybe you're chopping down the forest to burn the wood to make your food, and after awhile you've got no forest. So you can have unsustainable subsistence (which is actually very common) and you could have sustainable...non-subsistent sustainability. So the words, I think, are not synonymous.

More questions on this?

So briefly, I will give you a few comments on the overview on time because, as I mentioned, this is the fun stuff, and we're going to be doing a lot of stuff on time this half of the semester. Remember the first day I said there's...I wrote this down, and I said, "Who knows the meaning of this?"

Stochastic dynamic general equilibrium. Right? As I mentioned before, this is a form of what I call masturbation. So there's a whole bunch of economics...books and articles and stuff like that...discussing this thing.

Dynamic means, remember, that if I do something, then you do something in response. And then we go off and on and off and on. Think of dynamics. Think of a soccer game, right? The dynamics of a soccer game are unbelievable. You've got the ball going back and forth, and players running around, and this guy runs up there because that guy might pass it to him. That's a crazy set of dynamics.

Stochastic basically means there are random shocks. In a football game, somebody might be running around, and they fall down unexpectedly; that could be a random shock. Or your opponent falls down unexpectedly. That's, in a sense, why people watch sports... because they want to see stochastic dynamics. So all of these sports fans are fans of stochastic dynamics.

And general equilibrium is essentially how everything fits together within the play, okay? So again, with the soccer analogy, the general equilibrium is (with the interaction of all these things) after awhile you're going to...in fact you're never going to get to an equilibrium. But all the interactions of all the players, and what they're doing with each other, interact with each other, that is kind of a general equilibrium only in a sense that they are fighting each other back and forth. And if you want, if the game ends 0-0 or 0-1 or 2-1, that could be the equilibrium point. Or it's just the end of the game right?

So this half of the semester is going to be about this kind of stuff. I'm not going to use these words, but this is the kind of stuff I'm talking about in case someone says, "Oh you know about stochastic dynamic general equilibrium." And you say yeah; you say soccer. So now you know. And the role of time is very important.

I'm just going to give you a simple example that you've already seen before. Remember the prisoner's dilemma, and you have two people who are caught by the police and they're given the choice to confess or not confess. And if both of them confess, I'll tell you how to read this table again; just copy that down for a second.

So if both of them confess, they're both going to jail; they both get negative two payoffs. If both of them keep their mouth shut...now this is important: this is a one shot. They

only play it once. Not repeated. So it's one shot, not repeated (they mean the same thing). But it's a simultaneous move game. They are simultaneously deciding what to do. And if they both don't confess, and they both essentially go free, and they go together and drink beer...if this guy does not confess, and this guy does...essentially this guy turns in his friend, this guy gets this payment, because the payment to this guy is always this one here.

If this guy confesses, and turns in his friend...(if he confesses, he turns in his friend. That's what I mean by confess...he talks). If he talks, he gets three, and his friend gets minus three. His friend goes to jail for longer, because he gets framed for the crime. So this guy gets screwed if he's silent, and the other guy talks, and vice versa. That's what's going on here.

And in a simultaneous game, remember this is how you look at it. This is guy is looking at what to do. This is Mr. A and this is Mr. B. Mr. A is looking at what to do. And essentially, if I confess...no...if he does this, then I should confess. Because if he does this, those are his payoffs. My payoffs are three and two. I make more by doing C. Does everybody see that? Okay.

If he does this, then I get this or this. So I should do that. So this is a dominant strategy for Mr. A. Okay? And mirror example. Mr. B also has a dominated strategy to do... confess. And so what ends up happening is they both confess. And they both go to jail.

Now the prisoner's dilemma is a workhorse in terms of discussing game theory. You will be discussing it a lot. The key that I want to tell you about now is (to keep this in mind because we'll keep bringing it up) that it's a simultaneous move game. What would happen if it was a sequential move game? And let's say that Mr. A had to go first?

So if Mr. A does this...so here's the question. If Mr. A goes first, should he do that? If Mr. A goes first, Mr. B will see what he does and will decide what to do.

If Mr. A confesses, then Mr. B is either going to get -2 or -3, right? In terms of payoffs. So he'll end up confessing. But if Mr. A does not confess, then Mr. B is going to get 3 or 2. Actually I did this wrong. But actually this rolls two games together. If Mr. A confesses, and Mr. B looks at what happens, then Mr. B should what?

Confess. And this is the way I set up the payments. Well, you can switch these two examples around. But if Mr. A does not confess, then Mr. B should also...should turn him in. But think of it this way, there was another thing I was trying to bring in here. Indirectly I did. It was called the trust game. The trust game basically means...crap. I have to stop this. Well the trust game basically...if Mr. A trusts to not confess, then Mr. B is like, "Dude, you trusted me? I'll trust you back."

I didn't set up the payments correctly. But that's what ends up happening in the trust game. I'll get into that the next time. What I want to do now is I want to stop and hand out these evaluations. There's four questions. And I want you to fill in those questions. It's anonymous. And I want you to put it on the tray there on your way out. This is so I have an idea about what's going right, what's going wrong...in terms of this course. And

I can make adjustments...including going back and talking about stuff that...oh my god I never understood. So go ahead and fill that in.

Transcribed and checked for accuracy by Brynna Bunnag