EEP100 Lecture 21 (Nov 10, 2009)

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So hand in your 3 copies. I assume…did anybody not hand in 3 copies? Anybody put their name on it? Good. Okay. I'll get into how to grade these things and how we're going to distribute them in a second. I've got office hours today, although I think the demand for office hours might be a little bit lower than it would have been yesterday. That's at 12:30.

We will have a guest lecturer on Thursday. Pretty cool guy from the Netherlands who started his career with houseboats. So he'll come tell us about stuff. I have no…I just spent like 4 hours with him yesterday. He's a very cool guy. Ties is his name. And he will be talking on…

So here's what we're going to do on the grading, okay? So this is the moment where you want to take some notes.

Some person said, "Can I just say thumbs up/ thumbs down and give them their ranking? " No. Here's what you need to have on your grading of the briefing. I'll draw you a picture. One-page, margins, font, just like you did, okay?

Put your ID up here, put the ID of who you are grading up here. Gradee and Grader. I want you to write four things on this grade. I want a small summary of what they said in terms of their logic or in terms of their argument. It can be a sentence or so. This is a very common element in revealing journal pages…academic review of journal pages.

It kind of ensures that you actually read it. It also ensures that you actually understood what the argument of the writer was. So just a little…a brief summary. I'm not going to tell you that it's 3 words. I'm not going to tell you that it's 300 words. Just a brief summary, okay?

I also want you to write what you like about it, what you don't like about it, and I want you to rank it. And the rank is going to be…you can say one, two, or three. As in third place, right?

The whole student ID?

No, your last four. This is a double blind.

If you think that the second one is closes to the first one? That kind of thing? Yeah. It you want to put a note to us, this is might be the place to put it. "All of my colleagues are amazing. I can't wait to work with them in the future. Please give me funding, or whatever." Go ahead and put a comment down there. But obviously, you're not going to sit there and say, "I, David Zetland, think this, that, and the other about your crappy paper, or your great paper."

So…for after your ranking, do we need to give a justification on why…

No. This is your justification here.

But in the likes and dislikes, do we just talk about this paper, or do we compare it to…

I would not bother to do that, because that person is unlikely to read the other two papers. So what you have to…the way I would do it is…if I had three of these things, I'd sit there and I'd

read one and read the other and read the other one and go, "Well, my first opinion…my first impression, which is usually the most important one, is that I like this one better."

And then I will go ahead and do the analysis. On the other hand, don't sit there and say, "Ooh that one looks nice, and now I will find a reason to justify that it's the best one."

You have to put a little bit of brainpower to it. But then, if you go through this process, you could do it…the other way you could do it is you could summarize all three of them, write what you like and dislike and at the end say, "Well, actually, you know…this is how I want to rank it."

You can do it whatever way you want, okay? In some ways, there's no right way to do it. What you're just trying to do is to choose the one that you like the best out of all of them, and then the second best, and the third best.

So you want us to turn in three pieces of paper.

Yes.

One for each one?

Yes.

And it will be less than a page?

It will fit on a page.

It will fit on a page, right.

It will not fit on two pages; it will fit on a page.

But even if it's less than a page, you don't want us to put two in there on the same page.

No, no, no. Because what you're going to is you're going to hand…remember you're going to hand in the…your thingy plus the original stapled behind it. Because they're going to get it back. You're going to get back the comments of everybody else.

Plus we are going to somehow put a master summary grade across all of these things. It's like… you have no idea of the logistical nightmare that I have just created for us. The three of us—I and the GSIs. And I appreciate your forbearance. This is a very complicated way of doing grading. In the old school, I would just take all of your briefings, go to the top of the stairs and throw them. There's the A stair, and that's the B stair. But what we're trying to do is really build in a heavy-duty critical thinking cycle into a 90-person class. This would normally be in a 15-person seminar.

Do we have a criteria…like…to judge a "like" and "don't like" or is it totally subjective?

It's totally subjective. It's you.

So…I think like…I like this topic better?

You are the politician reading this. Or you're the politician's aid. And you're like…is this worth passing to my boss? The top one is the one you want to pass to your boss. The second one, given the possibility of time, you think that, "Well this is in second place. The third one: my boss doesn't need to see this." And if you are the boss, you'll be sitting there going, "Why did you give me this crap?" And then you fire your aid. Okay? so keep that in mind.

Can we mark on the original?

You can mark on the original. Don't leave any blood types behind.

Should we take into consideration if two of the papers are about the same problem/subject and use that as a criteria?

You can do that…you just don't explicitly cross reference the papers.

If someone…people are asking me: should I be specific or if I should be vague? The problem occurs over and over again. And if you're saying…

I saw someone said… "To my boss, the minister of finance in Peru."

You might be sitting there going, "I don't know anything about Peru; I'm going to give this one a bad grade. Try and step into that person's feet for a minute. And if it turns out to be hard because it's all written in Spanish, then that's fine. You give them a bad grade. So just try and read it as if it's directed to you. And you might need to step out of your particular pair of shoes, but only a little bit over, okay? don't go into strange land. Any other questions?

It is due the start of class a week from now. Next Tuesday.

And our homework 3 is also due next Tuesday?

The homework 3…we're going to hand out on Tuesday. I just realize that the cycle of crush is going to arrive. And it's like…we just worked, and now we're just working, and we're just working. And I'm sorry. That's what's going on. We might have a house party for the final. I'm not quite sure.

So we have discussion the week of Thanksgiving break? Or…

Oh. Yeah. So discussion is cancelled this week. Next week is the 17th through whatever. That's not Thanksgiving week. There will be discussion next week.

There's a strike.

It's a strike? Let's not even have school. When's the strike?

It's supposed to be next week. It's UC wide, so they're not holding classes.

The whole week?

No. The UC wide thing.

What day?

Wednesday.

Wednesday?

Wednesday to Friday.

Wednesday to Friday?

There's no school Wednesday to Friday?

No, no, no. Okay, look. Strikes are not university official holidays. We're having section next week. And section next week is going to be awesome because we're…I didn't tell Fei and Diana yet, but we're going to be doing some more games.

So we don't have any section the week of Thanksgiving, though?

Week of Thanksgiving: no section. Because we don't have Friday.

So our homework three is due after…?

No. The homework three is due the Tuesday before Thanksgiving. Thanksgiving's late, remember. It's 17 to 24. That's when your homework 3 is going to be due.

Can we turn it in earlier if we like…

You can turn it in anything early.

Then do we get the final briefing then? Or later?

The final briefing will be due on the 2nd? I'm not quite sure. Oh wait, I have the syllabus. What a shocking idea. The final briefing is due on December 1, which is the Tuesday after Thanksgiving.

[Groans]

Oh, sorry. It's not a 12-day holiday, okay? And remember you already know what briefing two is. It's rewrite your post on your blog. Alright? Get it on a page, make it better.

Is the jargon rule still applicable for the second briefing?

No. The second briefing is going to be…well it's going to be peer graded again. So, in a sense, you can…if you want to drop in marginal cost for your peers to impress them, go right ahead.

Is it going to be graded in the same way?

Yes. The nightmare will continue.

What happens…because the blogpost were written based on special interests. So what if you wrote about like…

The blogpost or briefing one?

The blogpost.

The blogposts were written on anything.

Yeah. So what if you wrote about football and the person who reads it doesn't know anything about sports. Isn't that kind of like…SOL? Right?

Yeah, you could be SOL. I mean…some people write about carbon, and people don't care about carbon either. So you're trying to simultaneously…you know this. If you wrote…maybe you wrote about a blogpost, and it's like, "Oh, good, football." And it goes on Aguanomics, where football fans do not hang out. So you can recast the blogpost any way you want. But the argument…the grading on briefing 2 is going to be the same as on briefing 1. It's going to be… how good is your economic analysis, how believable is your argument…I've seen some pretty good comments…this is the whole point, obviously. People that are commenting on your blogpost have been giving you help. And thall shalt refer to that and hopefully improve it because also…the people who are grading you…this is only a single blind on briefing two. They know who you are. You don't know who they are.

They can go look at those comments and say, ooh, I wonder if they addressed that issue. And not very well…or did very well. And that's what you'll be doing.

So you just said we could change it. You mean…you can change the topic, or change the like…

No, no. You should rewrite it. Your blogpost. To improve it. Including like…I made a typo or spell-o or whatever you want to call it, okay? If you just cut and paste it, then yeah, go for it. Your grader might not be so happy.

When you said you can recast it however way you want to…

When you rewrite, you rewrite.

But let's say you were talking about like…football? And then now you want to talk about the economics of sports teams. Could that…

No, I want you to redo your blogpost. So consider the one that went up on the blog was your first draft. So don't go change the topic to a new first draft.

What if you slightly alter the topic so it's more specific or more general?

It's your second draft.

So you want us to keep the same bottom line, but maybe refine the argument…

You can change that too, as long as you make it better. If you make it worse, then that was a bad move.

So is the grading versus each other or versus the improvement you did off of the first blogpost?

That's a good question. I will allow the graders to take that into consideration when they're ranking you. It'll be ranking again.

Yeah. So…which will it be more?

Well it's the overall, how does this piece stand alone? And if they sit there and say, "Oh and you improved." Well…if you improved from crap to a little bit better than crap, then it's not going to help. If you're going from awesome to super awesome then that's fine.

Did you want us to again…one page…

Everything the same. So all the same process. The only thing that's going to be different is that you're going to know who…theoretically you know who it is. And let's just not even bother to pretend. Because someone's going to…you obviously…I recommend that when you're grading briefing 2, you go and look up that person's thing.

Do we just write their name on it?

Yeah, I think that's fine. It'll make it easier to sort things out again.

Any other questions? Great.

So a little bit of…I want to wrap up this idea of incomplete contracts. The naive form of economics is that when two people make a contract, Mr. A and Mr. B, and they make a contract for performance. Let's just say it's a principle agent, even. You've got a…it's a painting contract. I'm going to paint your house. And Mr. B is the painter.

This is the agent, and this is the principle, forget the A and B. This is the principle, and this is the agent. There making a contract…you don't have to worry about adverse selection and monitoring, necessarily. This is just a typical example, okay? Yo u make the contract, and the contract says, "The agent is going to put in best efforts to paint the house for the payment of… whatever the hell it is…$12,000." I don't even know ho much it costs to paint a house. Anybody know

My landlord's a painter, ironically, I should ask him. You make a deal. I paint your house, you give me some money, right?

Now…what happens if half way through the thing, the guy comes out and says, "Oh can you paint the kid's room." Or halfway through Walmart runs out of off white taupe. And you put in another…version of off white. It's one of those yuppy torture questions, right?

So you kind of change colors/gradients half way. And then…at the end of the deal, you essentially arrive at a problem because the contract did not specify how to modify payment based on painting the kids room. Or did not specify what kind of deduction might happen if you kind of change the paint color on the way.

Some people might not care, right? and you're the painter, and you're like, "Dude. No one cares. It's off-taupe, and off-off-taupe. No one will know the difference, right?"

But if you have this homeowner who is like "Ahh" or even worse the homeowner is taking advantage of that to say that, "Oh, you breached contract."

This guy actually called me—an acquaintance of mine from DC and he said, "I was subletting my room." He called me last night. "I'm subletting my room until December, and my roommate is threatening to kill him, so he's moving out, and I said I'll pay him back the prorated rent until

the day he moves out. But he says, 'That's not enough; I want $50 more. Because it's expensive. And I will sue you if you don't give me $50 more.'" And this guy's calling me and going, "What…why should I…should I give him more money? Is he going to sue me because it's going to cost him $100 a night to stay in a hotel room, and my roommate who has made his life difficult, and…"

And I'm like…what the fuck? Right? But that's like an incomplete contract. When you make a lease deal, it's like…well…you know…you trust me, I trust you. You want a house…and you just kind of write general things. But you don't have a clause in there called, "I hate your roommate. Get me out of here, plus the bonus points/bonus payment when I have to go stay in a hotel."

And the guy was…it's one of these law student interns who basically should be shot. From UCLA obviously. So the thing is that…when you have an inconvenient situation of an incomplete contract, whether it's principle agent or it's peer-to-peer or whatever you want to call it. Then you're going to have a fight. Now you might end up on Judge Judy (my dad's favorite show), or you might end up in a fistfight in the hallway. But the problem really is that you didn't specify ahead of time what to do.

So the thing is…with incomplete contracts, you're going to get into a fight, and it turns out that the argument over how to fulfill the incomplete contract could end up destroying more surplus, in the economic sense, than you were making from that deal.

So if someone comes in and mows your own lawn for $10, and it gives you a utility of 5, or a surplus of five because you save yourself some effort, and then they mow down your hydrangeas (are those small flowers? Whatever…daisies…small flowers). And you're like, "Woah. I didn't say mow down…" And he's like, "Well you said mow it!"

Well, yeah, but the lawn. "Oh, but you didn't specify that." That's incomplete contract.

So you end up getting into a hassle, and you're in a fistfight with your lawnmower boy, and then you go to jail, and you're like, "Woah, that wasn't worth $5." So this is a problem, is what I'm basically highlighting, if I haven't emphasized it enough. And it's a problem that occurs all the time because when you write a contract, you cannot specify every potential eventuality. You can't specify if a tree falls on your house or whatever. And so…I'll get into another problem. You had a hand up, and then I'll get into some other things. Go ahead.

Can that also be called asymmetric information or is that different?

It's not necessarily about a principle agent model. It just ends up being that…maybe there's some uncertainty comes along. You actually make a contract with a painter, and then his wife dies, and he has to go to the funeral and stuff like that. And he does not finish the job on time. And it's like…hey you didn't finish the job on time. It's like…"Dude, my wife died." And it's like, "You didn't put that in the contract!" So…you have to be…this is actually where lawyers do make their money. Because you have these hundred…like the medical bill, which is like 1400 pages. Or like 1900 pages just to cover everything.

Now the most common example from economics of a problem with contracting is what's called a stranded asset. And that's what happens when a person who owns a mine makes a deal with the

person who owns a railroad, and says, “Build a railroad to my mine to carry the ore away.” Right? Now these guys are essentially peers, and the guy who’s got the mine says, “I need a railroad.” And they guy who’s got the railroad says, “I will build it to your mine (future tense) if you agree to pay me this many dollars per ton. Now, if you use your cost accounting, or… remember we were doing theory of the firm, for the railroad, what’s the balance between fixed costs and variable costs? Fixed costs are bigger or lower than variable costs?

Bigger.

Bigger, right? And what happens once you build that road? Are those fixed costs…what are those fixed costs called? Sunk, right?

So this miner guy can say look, “I’ll pay you $50 a ton to haul out X tons per year”, and the $50 is like $40 for fixed costs to cover your fixed costs and $10 to cover your variable costs because you, as the railroad guy, knows that you’ve got to payback the debt, and etcetera, and you know that you’ve got to put coal in the thing. And then the guy comes along and says, “Hey, you know what? I love your railroad tracks. They’re really nice. How bout I pay you $10 a ton? In fact I’ll let you have a profit--$11.” Now the railroad owner is screwed because there’s this essentially…yes, he can run the railroad at a profit, but he will never make back his fixed costs, and that’s because it’s hard to move railroad tracks around. So what you need in this circumstance is a very robust contract that can be enforced, which is a whole bunch of transactions costs, and the idea is that if you don’t have that, then you’ll never have the mine owner, or especially if you’re a mine owner with a bad reputation…no one is ever going to build a railroad for you. The only thing that really would work is actually to do what?

Build your own?

Yeah, build your own railroad. Vertical integration.

Now I mentioned this in terms of principal agent dynamics. The best way to take care of this kind of incomplete contract situation is to do what? There’s two key words that I’m looking for. Before you sign a contract what do you look into in terms of who you’re signing with?

Signal?

Kind of. What’s the signal that you’re looking for? Reputation, right? So before I sign a painting contract, I look for recommendations, right? That can be principle agent, but it’s also like…hey you know…if you go on to Yelp…so and so came out to paint my house, and he found this extra thing, and then he did it at no extra charge. Or he did it at a very reasonable extra charge. This is the kind of thing you like to hear when you’re signing these contracts. What’s the other thing that you want to do in terms…we can borrow from principle agents?

Do you go for like one huge contract that covers 16 years or what do you do?

Repetition?

Repetition, right? Lots of little contracts. Now, it’s not exactly easy to build a lot of little railroad tracks, but you can maybe do that in terms of a contract to get your lawn mowed. Say that you

say…the guy says, “Well, I can do it for $10 a week or I’ll give you $400 for the whole year, pay up front.”

And you’re like, “Well, let’s try it out a few times first.”

Is this the type of…you know in the Lynn Ostrom interview about the irrigation and farmers… how they can do it better than the government?

I think…what about that?

Well, that kind of this idea of building the mine/railroad…

Yeah. So the idea in the lynn Ostrom interview…why can farmers run their own irrigation scheme better than a government-run irrigation scheme. And this is like Napali farmers who are illiterate, okay? We’re not talking about…I think PhDs are actually worse than farmers in running irrigation. And that would be because those farmers are working together on a project that benefits them. Whereas the government is a bunch of people in office who are like, “Farmers? What are those?” They don’t necessarily care. So there’s an alignment of incentives when you have a local irrigation project. It’s run by the local irrigators. They might have conflicts with each other. But in some ways, they’re all in it together a lot more than this third party outsider. So it’s not exactly what we’re talking about, but it’s a good question in general.

Isn’t that the same, in a way, as the mine and the railroad because even though the mine owner can say, “Okay, I’m only going to pay you $10, and you miss out on your fixed costs” the railroad owner also has a lot of leverage because he can just say, “Well, fine, I’m not going to work for you at all.” And the miner gets stranded with all the ore, and he has no way of getting it out, so in a way, they both need each other, right?

Not exactly. Because if you offer $11 per bucket, right? Using the sunk cost analogy. You can actually…and I know that they will fight, and it could last for years. But in the end it’s like, “Dude, tracks are done. You can still make money.” That’s what sunk costs are about.

But isn’t that maybe where…

So the person who is more stranded actually is the railroad because he’s got debt. And this guy’s got a mine, and what happens is he just leaves his stuff on the ground. Fine. It’ll be here in 20 years. Like diamonds or gold. That’s a different…that’s an extraction question.

Is that assuming, though, that the person with the railroad would act completely rational because…my guess would be that he’s just…out of spite, the rail owner might say, “Well fine, then. I’m not going to…I don’t care about the lost costs.”

Spite would determine how far up this price would go towards $40. So the more stubborn…and if the railroad has a reputation of killing the people he doesn’t like, who breaks contracts, then the guy will be like, “Yup, $40, here you go.” So that’s where reputation come in on the other side, but the person who is more in trouble is the railroad owner who built this railroad could potentially be in debt. This guy is sitting here, right? He’s going to have operating costs to run the mine. Potentially, he’s got debt in buying the mine, but in this particular example, let’s just concentrate on this person’s situation. Other hand? No?

Okay. So that's a little bit on incomplete contracts. I just wanted to touch on that. Now we'll do some game theory. And we're going to do game theory because it's going to be your homework assignment. So take good notes.

I'm going to give you some jargon. The jargon in game theory is horrible. Because they take perfectly normal words and define them in narrow, technological terms, and then you have no idea…why perfect information and complete information? What's the difference? And honestly it's annoying, but that's what we're going to do. I'm not going to ask you on the final exam, you know, please tell me where it can…why perfect information isn't complete information, and complete information isn't perfect information because the words are just too close to each other.

But you should know this intuitively because that's the kind of thing that would show up.

So perfect information is essentially that you know you're in a game. The basic assumption is you know that you're in a game. A ludic…it doesn't matter. We're in a game. So you know all prior moves. Like Chess.

Or like baseball or like whatever. You know what's happened until now. It's kind of obvious, but there are situations where we would not know everybody's moves. What if you're playing poker and people are taking cards into their hand and throwing them into the discard pile. Is that perfect information? No, right? You don't know what they're throwing away.

Complete information is when you know the strategies and payoffs.

In chess, you do not know the strategy of your player. You know they want to beat you, but you don't necessarily know how they want to do it.

This is also…this is basically true in the prisoner's dilemma.

I'll write out the prisoner's dilemma because we're going to use that.

I'm putting different payoffs for the prisoner's dilemma because the game still holds in terms of strategies.

That's cooperate, right?

That's cooperate, yeah. That's cooperate versus defect. Cooperates mean you keep your mouth shut. Defect means that you keep your mouth open, and you tell things.

So the prisoner's dilemma is the game of complete information because you can see what the payoffs are, and you can determine what your opponents, or your colleague's strategy is. Because you look at the payoffs relative to what you're doing, in reaction to what you're doing. And then you can plan accordingly. And you know what they know, and they know what you know what they know, and so on. That video from Princess Bride.

Let's go over this for a second and review that. Okay, so if player two plays cooperate, the payoffs to player one are this one or this one? This is also terminology that you should keep straight because when we give you games on your homework, you'll be able to do the thing. You'll be able to solve them.

If player two cooperates, then player one wants to do what? Cooperate or defect?

Defect.

Defect. Because zero is greater than -1. This is advanced mathematics.

Player one wants to cooperate or defect? Defect. I put these check marks here not just because I'm keeping track of things, but it's also a good technique in terms of solving games that are complicated. Now, if player one cooperates, the payoffs to player two are -1 and 0. Which one is player two going to do? Defect. Get a payoff of zero. Or if you want, you could do it like this. This is a little bit more spatially accurate. And if player one defects, what is player two going to do? Defect.

So basically what you're getting is you're getting an equilibrium. And there's an equilibrium, there's a Nash equilibrium, there's a sub-game perfect Nash equilibrium, there's a perfect… there's all these equilibrium. I'm not going to use those words. I hate those words. They're too complicated. There is an equilibrium where you're going to get defect, defect. As in the plays by player one and two are going to be defect, defect. And therefore, you're going to get this payoff. This set of payoffs.

What's the difference between expected utility and expected payoffs?

Not too much.

But can we use it interchangeably?

No. You're not using expected utility because that's about probability. We're not using any expected utility right now. These are not expected payoffs. These are equilibrium payoffs. Again, those words are very similar and they sound normal, and it's the same in English, but they don't mean the same thing in economics.

Sorry, question. I thought we were comparing player 2, so wouldn't it be comparing -1, -10, and player 2…1, -1?

Hold on. Comparing player 2 given that player 1 does a move? Given that player 1 does cooperate,

If player two defects, then player one wants to do what? Defect.

Now if player one cooperates, the players to player 2 are minus 1 or zero. It's hard to get an idea of how this works. This is called a…what the hell is it called…is it…extensive form? Jargon. Extensive form versus what?

Strategic?

No. Diana do you know? Extensive form versus?

Reduced

Reduced form. This is called reduced form. It's reduced form. And I'll show you what extensive form is, but it's one versus the other. And, essentially, this is a simultaneous move

game because player two and player one are acting simultaneously. And it's complete information. It is not perfect information because they are moving simultaneously. So you don't know what they did because they did…they're doing it exactly the same time that you're doing it.

But is complete information you don't know what the other person's strategy is?

If complete information…well you know their strategy. Their strategy is going to be…player two is going to say, "Well, if player one does this…" no.

If player two says, "If I do this, then player one is going to do this." So that's strategies. Strategy is what you walk into the game thinking you're going to do before you make your move. And payoffs are what are going to result from strategies. In a simultaneous game, they run together.

In a sequential game, when you're doing one move after another move, then you're going to set down your strategy and the payoff will emerge.

In terms of the Princess Bride example, would the small man…he would have complete information but he wouldn't have had perfect information?

Good question. Definitely doesn't have perfect information. And he doesn't know…he doesn't have complete information either because the payoffs were… matter what he did, he was going to die, right?

So he was in a very bad asymmetric situation. And he was not the smartest Sicilian on the block.

Didn't he think he had perfect information though, because he kept on saying like…I know where you're from…you're this and this and that.

That's known as…when we go to Baghdad, they will welcome us with open arms. That is a problem of incomplete information.

Is it possible to have both?

Both perfect and complete? Yes it is.

In this case would it be?

What did I say? Did I have one that has both of them?

If you know all their prior moves, and you know all their…

Actually if we play this as a sequential game, where one person would move first and the next person would move, then you would have both perfect information because the second player would know what the first player did, and you would have complete information because you would know what the payoffs were. So if you're playing…

If you were actually playing this game (and that's actually kind of troublesome). The trust game that I told you about is a perfect information and complete information situation. If you're the recipient of some portion of the $10 in the trust game, you know what they did, so you have

perfect information, and you know what the payoffs are because it depends on what you do. And then you will make your choice.

So the idea is that if it could be sequential, and you can't see the other person, the first person would cooperate, and the second person would cooperate?

That's a form of the trust game.

I just feel like if the first person cooperated, the second person would be like…well…I want to know…

Yeah, so this is actually…let's get into this…there was a tournament of the prisoner's dilemma. It was run by this guy Axelrod. What it was…what Axelrod did was set up a tournament, and invited everybody in the world to participate. Please submit your strategy to play a repeated prisoner's dilemma. And now remember, the first time I said prisoner's dilemma, it's not repeated, right? But what would happen with repetition? What would happen over time?

People would know which player plays which strategy, and they would adjust their strategy according to who they play with.

That's right. So what he got was (this was back in 1980 which was…you know…when they're still using punch cards with computers)…and he took all these strategies and matched them against each other, and repeated the game 1000 times or something like that. Some unknown amount of times. Because you could always have…on the 1000th move I kill my opponent, or whatever. I kill my person. So he did that, and it was a repeated prisoner's dilemma. And all of these guys submitted all these strategies: game theorists, mathematicians, physicists, homeless people…everybody put in their idea. And it turned out that the strategy that resulted in the highest overall payoff to the person playing it was called "tit for tat". Now you guys have probably heard of this expression before. Quid pro quo, tit for tat, it's been around since the Roman's at least. What does it mean?

You screw me, I'll screw you.

You screw me, I'll screw you. So in terms of an extensive form of a sequential game, if you defect, I'm going to defect. If you cooperate, what am I going to do?

Cooperate.

And in the strategy, what was the first move to make? Would you cooperate or defect, playing this strategy?

Cooperate.

Basically say, "Let's cooperate." And the person is going to do what. They have a strategy. It's pre-specified, right? They can either cooperate…and then what's going to happen? And then… add an item, right? Add it to the end of the game.

Now…if they do defect, you're going to do what?

Defect.

And they do? They do something, right?

Is this in between two people?

Yeah, the strategist are all matched up pair-wise. Now the thing is this…it was…first move was cooperate and it was forgiving. Which essentially means, I cooperate, you cooperate. I cooperate, you defect, I defect. If you defect, I defect. If you defect, I defect. If you cooperate again, I cooperate.

It was forgiving; it was not vengeful.

There was another strategy called…the grim reaper or something like that, which is that…I'll cooperate as long as you do and if you defect, I'll defect forever.

Which is kind of like…I'll just keep shooting you. You keep bringing flowers, I keep shooting you. It turns out that the grim reaper, or whatever that strategy is called, doesn't work very well in the end, because you end up, basically, dead. The way to win this game is to get the most points. And if you get a point for cooperation, you get zero points for defect, the tit for tat strategy is the one that got the most points. It also turns out to be completely intuitive, in terms of the way that the kids play in the playground, and simple. And the other strategies that were submitted by all these…I think it was submitted by a psychologist. I'm not sure. All these advanced physics people, and all that stuff…many, many economists…it didn't work.

They didn't work relative to tit for tat. That's something you should know because its probably one of the most fun things in economic game theory. And there's more fun things in economic game theory. Okay. so…

So imperfect information is you don't know all the moves that came before you (just to clarify, just to repeat).

And incomplete information is you do not necessarily know what that person is going for. If you're playing a chess game with somebody, and they decide that they don't want your king; they actually want your rook. Then you're playing an incomplete information game.

Or you could have what's called…nature moves first. If nature moves first, then you think you're playing a game, and nature had done something to change what the payoffs were going to the left instead of going to the right. Then you're in a game of incomplete information because you don't know what world you're living in. People living in parallel universes could be happy with this.

Can you give an example of that?

I will in a minute, yeah. The whole debate over climate change is one of these issues, right? What is nature going to do when parts per million of carbon dioxide go to up to 550?

Is it all going to be cool? Are we going to have like a nice, little, Hawaiian climate? Or are we all going to die? The dolphins are going to eat us, or something like that. So we don't know… this is incomplete information.

It is very similar to uncertainty. You cannot necessarily assign risk to it.

Now…another piece of jargon. Very simple is what's called a cooperative game (not the same as cooperate in this particular example) versus a non-cooperative game. You'll recognize this because this is basically ludic, and this is conflict. So when I said before that ludic games are games that have rules, essentially the whole idea of agreeing on a set of rules and sticking to those rules is a type of cooperation. If you are playing a non-cooperative game, essentially, you bring your chessboard to the park and say, "I want to play a game." And the guy brings his baseball bat and says, "sure". That's not cooperative.

With a non-cooperative game, you cannot commit ahead of time to a set of rules that will be binding. Cooperative game: you can commit ahead of time. You can also commit and say, "If I defect, this gun will shoot me." That is a form of a cooperative game. And there are strategies that involve…if I do this, I will die.

So then do games change for ludic and conflict if their first set of rules, everybody agrees until the firs person say…now I'm going to get out my bat.

That could happen, right?

Then it becomes a conflict.

Right. It's like the Malotov-Ribbentrop Pact before World War II, right? It was like…the Soviets…Stalin and Hitler. Two really nice guys. They decided, "Hey. You know what, Poland? Let's split it up." So they made this Malotov-Ribbentrop Nonaggression Pact. It was publicly announced; everybody's like…Holy Cow these two guys are working together. They've already been killing people like crazy. There was a secret code that said we'll split Poland in half or whatever…and who needs the Poles anyway? They didn't announce that. And they went and they split up Poland. And Stalin was happy and Hitler was happy.

And then…interesting…Trostksy was like, "Stalin's going to screw Hitler. And Hitler's not going to know what to do." And Stalin screwed Hitler. No. What happened first?

Hitler screwed Stalin. That was it. Hitler knew Trotsksy. Hitler screwed Stalin by invading the Soviet Union. And Stalin's like, "Holy cow!" He didn't believe it. So that where Stalin and Hitler had a cooperative agreement, and then Hitler said forget about it. That is why war is hell. That's the example there.

The concept of a Nash equilibrium (I am going to tell you about that because it comes up all the time) it essentially means you cannot gain by changing your strategy/changing your move. So it's like…given the action by A, I can't gain by changing my action. I, B. Actually let's just do it this way. Keep that in mind there.

Given the action by two, one cannot gain. Given that two does this, should I change my strategy. The action…that's kind of a loose word. Let's put strategy. Given the action, strategy, payoffs… given that this person has this set of incentives, should I change what I do?

If I change what I do unilaterally, will that make me better off? If I'm playing a prisoner's dilemma, and I'm sitting there…I'm Mr. One. And I'm looking at those payoffs to Mr. Two, can I change my strategy from defect to cooperate and do better? Well…given that he's going to defect, I will not do better. I will lose ten instead of losing five.

So…because I cannot do better, I will stick with my strategy, which is to defect. And if you look at the incentives that Mr. Two faces, it's exactly the same. Do not change your strategy. This game is in an equilibrium of defect/defect. A Nash equilibrium of defect/defect.

So the commonsensical idea of Nash is that…should I change what I do, and if I change what I'm doing, will that change what they're doing. Because if you could change what they're doing, and they're doing the same thing, you're getting paid off better. Then you are doing the wrong thing, right? if you change what they're doing, and you don't change what you're doing, and you don't get anymore, then you shouldn't change what you're doing. Whole bunch of words.

The idea basically is that…can I do better by switching. If I can't do better by switching, then I stay here. If they can't do better by switching, then they stay there, and that's an equilibrium. A Nash equilibrium.

Can you have a Nash equilibrium for each person?

A Nash equilibrium means that the strategies of the two people will not change. So, potentially, in a different game, you could have this move by one person, and this move, which is not symmetric, by the other person, and it could still be Nash. And this would end up being the Nash equilibrium.

So they don't have to make the same move. Their moves have to be robust, that they will not change their moves.

Is that your question? Any other questions?

So there is a better strategy out there, but neither of them independent of the other one can change it. If they can collude, they can technically overcome.

Coordinate is the question, right? So here's the coordination game (let me just put it next to here).

Let's just make this left and right, and up and down. Simultaneous move game, these are the payoffs.

If Mr. One does up, what should Mr. Two do? Left.

If Mr. One does down, what should Mr. Two do? Right.

If Mr. Two does left, what should Mr. One do? Up.

If Mr. Two does right, what should Mr. One do? Down.

Is this a Nash equilibrium? It is not a Nash equilibrium because…

There's two equilibria, but if I switch my situation then they should switch their position. It's not stable. I might be abusing these words. Don't worry about the word Nash for a second, right? But there are two equilibria. Here and here, right? It's a simultaneous move game, though. So if you move wrong…

So this is why they call it a coordination game. Given that I move up, you're going to want to move left. But if I move down, you're going to want to move right. But I don't know what you're going to do. So there's no clear strategy. And the only strategy, actually, to play this one is called a mix strategy. Essentially, to flip a coin before each play. Heads, I go up. Tails, I go down. And if they're flipping a coin simultaneously, then that's the best you can do. So it's called a mixed strategy. That's the jargon. Mixed.

On average, you're going to get a payoff of a half. Sometimes you're right, sometimes you're wrong. And that's kind of an expected payoff. If you play a mixed strategy of playing up 50% of the time and down 50% of the time. then you're going to get 1 50% of the time and 0 50% of the time.

So is that the same thing as expected utility?

It is not expected utility. Well, no…utility is…you go to a payoff, and then you have…you can call it expected utility because it has probability built into it.

But the expected payoff is what's driving expected utility, right? But you're going to have an expected payoff of ½. Because ½ the time you get zero, and ½ the time you get 1. And utility… don't worry about utility. Just worry about expected payoff.

If you decide just to do "UP" all the time, isn't your payoff still 1/2 depending your probability…

You're doing up all the time, and they decide they're going to do right all the time, then you're going to get zero all the time. So it turns out that "all the time" is the problem. If you literally just flip a coin and if they're flipping a coin, that's okay. If they declare: I will shoot myself if I go left. Then you're like, okay, I'm going to go down. Because they're making a credible commitment. Let's hope. Within your cooperative game. That's interesting cooperative…I will shoot myself…but it is cooperative. They're making a credible threat to carry out that strategy and then you know you should go to that play.

Game theory is like…insane in terms of how big it's gotten. So I'm just trying to give you this kind of overview from a high altitude. And hopefully not to confusing altitude. But we'll see how that goes.

Is the prisoner's dilemma considered a non-coordination because if they were able to coordinate, wouldn't they both cooperate?

Well, they end up coordinating around this, given the payoffs. It's considered to be a negative sum game, because the coordinator round is a bad set up. They would prefer to switch to this, but there's no good way to do it.

Is it considered a coordination game?

It's not a pure coordination problem because this is a Nash equlibrium here. So these two equilibria are equally beneficial. They just can't figure out how to get there. This one is clearly superior. But getting there is a problem.

So they can't get there?

Well, they do get there on repeated games. Because then you can play a tit for tat strategy. In a one shot game, it's hard to say. I would love to…explaining game theory…you see what's going on with explaining how to beat it or what the terminology is like is really kind of hard. I dislike the terminology because it's too complicated. To many words mean important things.

Any other questions about this? I'm going to keep going on the game theory stuff.

So you can get out of a prisoner's dilemma situation if you can repeat or if you can incredibly signal what you're doing.

Let me give you another example just to make it annoying about how these things work out.

So we've got these payoffs: up, down, left, right, 3 2 1 4 2 6 5 and 1. Those are the payoffs.

If Mr. One does up, what should Mr. Two do? Right

If Mr. One does down, what should Mr. Two do? Left

If Mr. Two does left, what should Mr. One do? Up

If Mr. Two does right, what should Mr. One do? Down

That was annoying. You just cycle and cycle and cycle. This is almost like you want to have…if you have a coin flip scenario, you would not want to do 50/50 coin flips, would you? Just for the sake of example, say that two is playing left and right with a coin flip. 50% chance of left, 50% chance of right.

So Mr. One, if he's going 50/50, if Mr. One does up, then he's going to be getting…I'll do this now…

If Mr. Two is doing 50/50, then 50% of the time, Mr. One is going to be getting a choice between three and two, choosing up and down.

I'm confused.

Is Mr. One does up, and Mr. Two is going back and forth, then ½ the time he's going to get 3, and ½ of the time he's going to get 1.

What's the expected payoff, or expected utility if you want, of that.

Two.

And if he goes down…½ times what? Not 6…payoffs to one. Two. Plus ½ times 5. Expected payoff is going to be?

3.5?

Three point five. What's the better play for one to make?

Down

Down, right? Given that two is flipping back and forth between left and right, one should go for down.

Here's the thing, what's going to happen…

What's going to happen is this 3 ½ means that One is going to be for down, and Two is going to sit there and say, "Wait, One is going for down. Maybe I shouldn't be going back and forth 50/50."

Then Two will start looking at the same addition here, and saying: "If one is going down, I'm going to be getting either six or one. I should be spending a lot more time on left." Do you see that?

If one is going to go down, two should go left. And if two is going left, that's not 50/50 anymore. So what happens is…two starts going left all the time. But if two's going left all the time, what should One do? Go up.

So this is how the strategies would evolve. In fact…even if you're going to play this game one time, you can figure out, essentially, a mixed strategy, which means that for some proportion of the time, you play one game, or one move, and some proportion of the time, you play another move, but it's not 50/50 for One, and 50/50 for Two.

It turns out to be (I don't even know) 1/3, 2/3 for one…1/3 of the time play up, 2/3 of the time play down. You see what I'm saying? You start moving around the mixture of your moves according to the other person doing it, and you're essentially solving them simultaneously to find out where you want to get an equilibrium. And there will be a Nash equilibrium (this is how the Nash equilibrium emerged). And then (we actually are going to play it one time) you would flip your coin that's weighted 2/3, 1/3 or 75% or 72%, 28%. Does everybody understand what I'm saying there? That's going to be on the homework.

I'll put some random stuff up and you're going to work out what the percentages are.

There's no Nash equilibrium to begin with, but you manipulate it to get one?

There's no pure strategy like…up with a 100% chance, and down with a 0% chance, right? But there's a mixed strategy with a percentage chance on each of those moves. That's what a mixed strategy is.

And of course, when you're out in the world… you're not…in football you're not…actually, in…they've done some games with soccer players shooting penalty kicks.

They've done some games with soccer players shooting penalty kicks.

And it turns out that there's a big strategy there. You have a goalie, and the goalie's going to jump left or right, typically, right? And…or stay in the center, I guess. And it turns out when they do this with real soccer players in an experimental lab, they're very good with randomizing their left/right. Because they understand that penalty kick type of strategy. If you're out there and you're playing high school football, you might be like…I always go right because my car has a right hand drive. I don't know. Some kind of superstition. People who are pros that repeat this game a lot…they actually understand mixed strategies and they use mixed strategies. But

for us, in most of our situations, we're not used to that. If you play sports, and you're used to dodging left or dodging right, you realize that you want to randomize in a very random way. Not like a fake random way.

So how would you find percentage…

You would just keep working through those payoffs until these two are equal.

Can you explain how you did that?

How I did this? I just said that given that Mr. Two is going left or right, with a 50% chance of each. So if he's doing left 50% of the time, and I play up…so given that I play up, half the time I'm going to get three, and half the time I'm going to get one.

If you start with one of the players, that's 1 of 6, and then…

Yeah. You've got a whole…it's like…given that I do this, and they're doing that, what are my payoffs going to be? And given I do that, what are my payoffs going to be?

And then you would iterate to go through the step by steps. Till you update one, and you update the other, and you one and you update the other.

And at some point you'll converge. In the homework you will because I'll make sure you do.

So the probability of 2 goes left, 75% of 9, that has to be equal…

If the probability of 2 goes left ¾ of the time and I'm playing up, then I'm going to have, yes, ¾ times 2. And this will be ¼.

Okay so let me explain the sequential game, and then we're going to redistribute the briefings. A sequential game only means that if one person moves, then the other person moves…in sequence.

So this is player one is choosing between up and down. And player two is choosing between… given that player one goes up, player two chooses between up prime and down prime. Or if player one goes down, player one is going to choose between up prime and down prime. And there's going to be payoffs.

The payoff to player one is always going to be the first payoff. The payoff to player two is always going to be the second payoff. Player one moves first, player two will then be at one of these nodes. This is the jargon. It's called a node. It's called a branch. So player one is going to on the upper branch, the down branch, and player Two is going to be at a node, and at the node they're going to make a decision. So let's look at player 2's strategy for a second, here. Now… this is the most important thing on how to solve this game. I said it before in the class. Backwards induction.

I have no idea why the word induction is there, but it's like backwards logic…whatever. Okay. Through backwards induction. If two is facing the choice between up prime and down prime on this node what are the payoffs that two is choosing between? Zero and one. Which one is player two going to do? Down, right?

If player two is choosing between up prime and down prime, he's going to choose between two and one. What's he going to do? Up, right?

If player two is going to be doing up or down, player one says, "Ah hah, I have to decide where I want player two to be." Where does player one want player two to be?

Down

Up? Down?

Which one is it? Player one is choosing between two and one. Which one does player one want? Two, right? Player one will play up.

That's how you solve that game by backwards induction.

How would you be able to say that two would choose down?

If player one plays up, two is going to get either zero for playing up prime…

Are you playing against someone? Are you playing to get your own points, or are you playing like…

You always look at the payoffs to yourself. You don't necessarily care that player one makes more or less than you. You look at your own payoffs. So there could be some notion of envy involved. I want to minimize their payoffs.

But this is a game. Whoever has less points in the end, you lose.

No, this is payoffs. This is payoffs. So you don't want to go for this because we both lose. We tie at zero. What you want to look at is…do I prefer to have one scoop of ice cream or zero scoops of ice cream?

How would this work in a kind of repeated game? If you get a better payoff for one…

If you were doing a repeated game, then you would keep putting more and more branches at each of these nodes until it blew up into this whole root system. That's going to show up on the homework. As long as you can fit it on a page. Landscape.

So the solution to the game is that one is always better off than two?

No. It's nothing to do with one better off than two. The solution to the game is Up, Down prime. Player one will play up, and player two will play down prime. In a sense, that's an equilibrium. Or Nash equilibrium. Something like that.

At some point, wouldn't two choose up so that number one has to choose down?

If two is choosing up…then they would be getting zero.

But in the next trial, one wouldn't choose up anymore because two would just try again. because you're trying to get…two is trying to force one to go down? Is that what you're saying?

One goes before two…

One goes before two, yes, that's true.

You're just going to repeat it if one is always going first.

One is always going first.

So two never has power to choose the end result.

Two does have power to choose the end result, but two acts in his own self-interest, which is that he would still prefer 1 to zero.

So in a repeated game, he'll always choose down.

If they play this game over and over again, then two would always choose down, yes. because one is always better than zero. We'll get more into this stuff, but right now I have to…this is fun, very fun, but we'll have to stop and do our distribution of these briefings.

Transcribed and checked for accuracy by Brynna Bunnag