[SQUEAKING]

[RUSTLING]

[CLICKING]

BEN OLKEN: OK, let's get started, everyone. All right, so just to remind you guys where we were, we're talking about land issues. And in the previous lecture, we talked about moral hazard issues and how do we think about moral hazard in land. And the second piece of the land puzzle that I want to talk about today is about land titling and the impacts of land titling. So that's going to be the main thing today.

So there's a few other things I just wanted to finish up, on land, on the moral hazard stuff first. So I think we basically finished the-- we finished the discussion of the experimental paper. The last thing I just wanted to mention was if you think about the theoretical models that I outlined last time, we talked about both moral hazard models and limited liability models, insurance kind of motives and limited liability challenges.

And you might want to distinguish between those two. And here, I don't know of a super great paper that does that. So I just wanted to mention this because it seems like a natural thing that you'd like to distinguish between those two.

There's a paper by Laffont and Matoussi that thinks about this. This is, as far as I know, the original limited liability sharecropping kind of paper. When you say original, it's always a risk of someone to find something from before that. That's the one I know of.

And in their paper, the way they think about this, they think of this idea of working capital. So working capital is like money that you have available to you in the short run for buying things, like paying your rent or buying your fertilizer inputs, or whatever. And their idea is that that working capital is the thing that's going to determine the limited liability constraint for how much you pay upfront.

So in their model they, basically say, instead of saying l has to be greater than 0, they put in this constraint that the amount that you pay-- this l is the payment in the low state, if you remember from the model we had last time. So l greater than K, then the higher K, the more the contract looks like a rental contract rather than a sharecropping contract.

So that's fine, whereas in a risk aversion model, then what should matter is your total wealth, not just the amount of liquid assets you have. So that's the test they use to argue for limited liability. So what do you think of this as a test-- good idea, bad idea? What do you think? It's plausible, not plausible? Yeah, Aaron.

AUDIENCE: Wouldn't you mean that wealth is pretty highly correlated with working capital?

BEN OLKEN: Yeah. Suppose you could measure them both.

AUDIENCE: I mean, another-- don't we also think that risk aversion is decreasing overall, so that--

BEN OLKEN: That's-- yeah, that's the idea, exactly right. So risk aversion would be decreasing. so the idea of the test is risk aversion should be-- if is a risk aversion model, then the determinants of whatever-- of sharecropping or whatever-- should be your total wealth. Because in a risk aversion model, your-- well I'm not going to write it down because I'll get it wrong.

But your utility is a function of your total consumption. Your total consumption is a function of your total wealth. And you can use your total wealth to smooth your consumption choices. So that's kind of what's driving risk aversion. That's why risk aversion should be a function of total wealth whereas the limited liability is that you have cash that you need to pay.

AUDIENCE: [INAUDIBLE].

BEN OLKEN: So yes, exactly. The idea is if it's a function of total wealth, it should be the risk aversion model. If it's a function of the limited liability, they're going to argue it's-- sorry, if it's a function of working capital, they're going to argue it's the limited liability model. So what else do you think-- good idea, not good idea? If I were to put up the results, is this is a good test? Yeah.

AUDIENCE: I just asked is it clear those two things are different? So if someone [INAUDIBLE] household [INAUDIBLE]?

BEN OLKEN: That's true, but again, that's a related question to Aaron's. So suppose I can run a regression. Suppose I get data, and I run sharecropping is equal to alpha K plus beta W plus epsilon, where this is working capital. And this thing is your total wealth.

So to run this regression, number one, I have to be able to measure these two things separately. And number two, I have to have some variation. So you're right-- for some households, they'll be the same, but those aren't the ones we're going to identify this thing.

I mean, if everyone looked like that, then you wouldn't be able to run this regression. So this is going to be identified off of some households that have different amounts of working capital and some households with different amounts of wealth. So yes, some of them will have none of anything, but then some must have some wealth and not much working capital, and some must have some working capital and not much wealth. That's what can identify this regression.

So suppose you can run this regression and you get some coefficients alpha and beta. What do you think that tells you? Or is a good test or not a good test? Yeah, Kadesh what do you think?

AUDIENCE: Why do we think that what capital is this [INAUDIBLE] measure [INAUDIBLE].

BEN OLKEN: Sorry, you guys--

AUDIENCE: Sorry, why do we think working capital is the limit of-- couldn't someone be taken to court, get total wealth extracted?

BEN OLKEN: Yeah, so right. So number one is it could go the other way. So could be if you have wealth, you could go to court and get the wealth. You could.

So that's one reason. So I agree with you. So certainly in a well-functioning legal system, absolutely, they go after your total assets.

They can make you sell illiquid assets or whatever. And so that's one thing. What else? Yeah, [INAUDIBLE].

AUDIENCE: They are naturally [INAUDIBLE] and I would think [INAUDIBLE] wealth is measured with much more error than [INAUDIBLE].

BEN OLKEN: Yeah, so actually, I'm not sure I agree with that. But you're right that there could be measurement error. They're correlated in their measurement error. So I agree that's going to be a problem for interpreting this regression.

So that's all kind of related the measurement issues. But the reason I'm not sure I agree is actually, your total wealth, if most of it's in your land, that might be relatively easy to value compared to actually adding up your working capital. It may be hard to find that. So it's not obvious to me which is a better measure.

AUDIENCE: Because we are computing for both, they are adding both.

BEN OLKEN: Yes, I agree. So if you have measurement error, if one thing is measured poorly and they're correlated, that could be a problem in this regression. Yeah.

AUDIENCE: I don't have the [INAUDIBLE] to that, but I feel like having no working capital would make [INAUDIBLE].

BEN OLKEN: Yeah, so why? Tell me more about that.

AUDIENCE: Well, it's just like-- it just seems like-- I don't know, it just seems like there's this direct relationship.

BEN OLKEN: Yeah.

AUDIENCE: I don't know, is that--

BEN OLKEN: Yes, that's exactly-- so that's the second thing I think is a challenge with this regression, actually. I agree with you. So if you think about, if you take any Behavioral Economics, you'll see that people make all kinds of risk-aversion decisions based on things that don't look like-- the standard economic model says you should be making-- what should matter is your total wealth because that's going to affect the degree you can kind of smooth your consumption from period to period, and/or you're directly risk averse over your total wealth.

But we know people make all kinds of decisions that look like they're not like that. So people think about cash on hand. They make decisions over much smaller lotteries.

So it's, I think, very easy to think that if I have some cash on hand that's very liquid, and then a bunch of stuff that's illiquid, I might be thinking about the liquid piece when I'm making my-- thinking about my risk aversion decisions, even though our good economic model says that that shouldn't be the case. So I think that's exactly the second set of concerns here.

There's also a non-behavioral economic story to that, which is just like if there are costs of taking the non-working capital piece of my wealth that's not liquid-- like I own a lot of land. Yes, I own that, but actually, there could be some costs of using that for consumption smoothing. And even a straightforward economic model might say that actually, the working capital is more liquid and therefore, I going to be more risk averse-- my risk aversion will be determined by that piece, not the overall wealth.

So I think both of these are a challenge with this test. They find that the working capital is more predictive than total wealth. And they argue that's an evidence of sharecropping.

But I think these are some reasons why you might not think this is the final word on that. And I just wanted to think that through because I think that that's like- this test is an example of taking the theory super duper seriously. But I think for the reasons that we talked about, actually, it's not totally obvious. So that's all I want to say about that. Other questions?

All right. And the final thing I wanted to say about this is, as I mentioned, I think that there are important implications of these two different models for land reform. So as we talked about, under a limited liability, this could have a really big long-run effect. The big long effect is it relaxes kind of your liability because you don't pay anybody.

Under risk aversion, it would-- you might have less risk aversion because you're not wealthier because you own the land. So on a pure risk aversion story, you would be a little bit richer. But on the other hand, if you're still risk averse, sharecropping might, again, kind of emerging endogenously as a way of insuring some of the risk that you're still faced against.

So that is a prediction that would be really interesting to see what happens. Like if we do a land reform, does this kind of institution emerge endogenously again or not? And how does that happen? And that's not a paper that I think that there's a great paper on.

More generally, I think that if you think about the paper we saw about moral hazard, another prediction of a land reform is that it should lead to substantial productivity improvements. So this one this one in some sense is about how do we share kind of what's going on. So several things-- number one is land reform should make the-- if you're just giving the land, if you're just redistributing it, that should make people richer.

Number two, this is unclear what's going to happen to the form of the contract. Number three, if there's moral hazard going on and you don't end up back in the share arrangement, then you might think there's going to be substantial increases in output. Yeah, Kyle, do you have a question? It's a little hard to tell people without the math sometimes.

So it would be really nice, I think, to understand what the implications of land reform are. And my own view is that I feel like there is an awesome land reform paper waiting to be written. And in particular-- first of all, there are a lot more failed land reforms successful land reforms.

There was a huge amount of political pushback against land reform for, I think, obvious reasons. The people who were going to get their land taken away from them were A, upset, and B, wealthy. And so it's not totally surprising they were able to push back.

So a lot of them didn't work. But some of them did. It was a few. At least I think there were some examples.

And so some of them had sharp discontinuities in the amount of land people could retain, like up to 1 hectare, up to 5 hectares, or whatever. So it feels like you should be able to-- if you had the right data, I could imagine you could match your pre-period data on what land parcels were and you could somehow match everything. You could find discontinuity in your data. You could try to do that. And then you can watch what happened, both to the people who got wealthier, to the land-- did it get more productive-- to the contract form, all that stuff.

So there's a paper by Kitamura in Japan, which tries something similar to this but without the microdata. They have to aggregate things up. There was a paper by Joonas Tuhkuri, who's a grad student actually [INAUDIBLE] market tried at some point to study in Finland. For some reason, it didn't work out. I don't remember why.

I, working with a grad student a number of years ago, spent a summer, or the student spent a summer working with me, looking around for examples all around the world of examples where we had the-- could find the discontinuity, and the landform that happened, and the data. And we didn't come up with any. But I'm just going to leave this out here as something I would like to see in a paper. Because an important part of a PhD class is not just showing you the papers that have been written, but mentioning papers that haven't been written yet. Because that's kind of, of course, the goal.

So anyway, some related studies-- here are two that came out relatively recently that are related. There's also a paper by Abhijit and coauthors looking at a tenancy reform in West Bengal, which basically, as I understand it, gave existing sharecropped people greater protections and greater rights, but didn't actually change, totally go all the way to the farm ownership. But that is another one you can look at.

The paper by Galan, which is a study of Columbia, which looks at people who were-- there was this program that provided land for the poor. So this is closer. I don't think it's quite the same, for a variety of reasons, but I'll mention this one as one you could look at.

There's also a paper by Montero, which is an RD that haciendas, large haciendas, were reorganized into worker cooperatives. But of course, worker cooperatives are not the same as divvying everything up individually to the individual worker. So these papers are closer and interested.

And I would recommend these plus the West [INAUDIBLE] Bengal paper, all of these are in the West Bengal paper, if you're interested in this topic. OK, that's what I want to say on moral hazard and land reform before I move on to land titling. Any last questions or comments? So the discussion thus far-- yeah.

AUDIENCE: I have a question. So if in any of these letter forms, what you're doing is you're giving property rights to some people. Are they then required to farm that land, or can they become landlords themselves?

BEN OLKEN: I think it depends. But I'm going to talk about some of this. Yeah, I think it would depend.

That would be one of the things you decide. In principle-- but that's actually kind of related to some of these other questions, like or can they choose to become sharecroppers again? Could they choose to sell the land, pocket the money, or exit farming entirely?

Maybe the other thing they could do is they could sell the land and move to the city. So there's lots-- if you have that kind of complete ownership, you can do what you want with it. But in many cases, but in some cases, no.

And actually, that understanding of whether or not-- whether you get the land and it's fully sellable and transferable versus you get the land but you can't get rid of it-- has huge implications. Because you might decide you don't want to be a farmer anymore. And so the efficient thing to do is sell the farm and move to the city. But if you're tied to the land, then you can be stuck with that. And I'm going to talk about some related issues in the land titling section right now, actually.

So the discussion thus far has been about contract type, essentially, own versus rent and the implications for moral hazard. But what I want to talk about now is this idea that-- this is kind of related, actually, to this point-- conditional on owning, there are different degrees of ownership. And those can matter in really important ways.

And in particular, many people in many developing countries do not have well-protected formal titles to their land. So when you think of a land title, you probably think of a deed that says, this is my land, and I can, if I want to sell the house, or sell it, or mortgage it, or whatever-- that piece of paper saying this is the land, this is my title to the land, is really important.

And so if you don't have formal title to your land-- maybe you own it, but it's kind of some informal understanding that you own it-- that can create all kinds of distortions. For example, it might have reduced investment. So for example, if I don't know that I own the land forever, then I might not want to put a lot of fixed investments into my land because I can be worried that I'm going to get expropriated and lose the returns of that investment.

I may have to put in costly effort to prevent expropriation. So for example, I may have to stick around. If I own the land and I have clear title to it, I can go work in the city and be confident that my land will still be there and still be owned to me.

If my title is not great, I may actually have to be there to prevent someone else from coming and taking it. So there are things you have to do. And we're going to talk about all this. This is an overview.

Another is misallocation. so if you think about the Coase theorem, which you guys have heard of the Coase theorem, yes, no? I always assume that everyone-- sometimes I assume everyone knows everything. Of course, then what would be the point of having the class?

So in the Coase theorem, it basically says if we have good, formal, transferable property rights, then the property should end up being owned by the person who's going to the most efficient owner. And if we have a transfer-- if we have full ownership in markets, we'll be able to do that. Because if I have a higher value of the land than you do, I'll offer to buy the land for more, and eventually, the land will get allocated to people with the highest value of the land. But if I can't sell the land, then we could end up in a world with misallocation, and people who are not particularly good farmers or whatever may end up owning the land because they can't sell it to people who'll be better farmers.

And the fourth one is that I can't either sell or mortgage the property or use it for other transactions. So if you ever-- I suspect none of you have bought a house yet. But when you do someday, you will probably get a mortgage.

And the mortgage basically says, I pledge-- there's actually two documents in the US, at least if you buy a house. One is a loan saying, which is actually, as I discovered when I bought a house, the short document, which basically says, I owe the bank X $1,000. Then the more complicated document is the mortgage, which basically says, and if I don't pay the loan, you can take my house, and that I'm pledging the house as collateral for the loan.

And the idea is that the ability to have good titles is important because then you can use them as collateral for loans. And it can relax your credit constraints. And there was a big argument by De Soto, in I guess, I think, the late '80s or early '90s or so, which was basically arguing that the lack of formal title was creating a lot of credit constraints and putting limitations on people's ability to borrow.

So what I want to talk about now is what do we know about all this stuff. And in some sense, De Soto was saying this is a huge problem, and then there was all this evidence, work trying to understand it. And you'll see where I think we are on some of this stuff. Questions? Overview? Yeah. Good.

So as an aside, let me just say that the institutions of property rights are complicated. And by this, I'm going to give you an example as follows. So suppose you were buying a house, and someone offered you in exchange for all the thousands of dollars what's called a "quitclaim" deed.

A quitclaim deed-- this is a definition that you can get from Wikipedia-- a quitclaim deed says the following-- the owner or grantor of this deed terminates or quits any right or claim to the property, thereby allowing the right or the claim to transfer to the person you're granting it to. But unlike most other property deeds, a quitclaim deed contains no title covenant and thus, does not offer any guarantee or warranty as to the status of the title. So the grantee is entitled only to whatever interest the grantor actually may or may not possess at the time of the transfer.

So this means that the person issuing this deed does not guarantee that he or she actually owns the property, or if she does, that no one else has a claim on the property. It's just saying-- this deed basically says, if I happen to own anything in this property, whatever I may or may not own, it's yours. So would you buy that house? What do you think? No. Anyone else?

AUDIENCE: Well, if you have some mechanism to verify what they [INAUDIBLE] very simple registry, then that's kind of--

BEN OLKEN: Right. Like Salome, when I first heard about this, I thought this sounded insane. Why would I possibly do this? Turns out every deed, essentially 95% of deeds in the State of Massachusetts, including my house, come with this form of deed.

And why is that? And why does this possibly work? So I think, as you're saying, Rebecca, it's not the quitclaim deed in isolation.

So what basically happens is we here in Massachusetts have very good land records, but not perfect land records. So when you buy the quitclaim deed, you can go, or your lawyer can go, and search-- go to the registry of deeds and search the history of quitclaim deeds back to your house. And they can say, well, so-and-so has a quitclaim deed from some previous person, previously so-and-so, and so forth. So it looks like maybe there's something going on there that looks-- and that gives you reasonably good assurance that the person who's giving you the deed probably owns the house.

And if not, you also buy title insurance. So when you buy a house, at least here, you have to buy insurance against the fact that maybe they don't actually own the house. And it's a small enough risk because of the pretty good information that actually, that insurance is not-- I don't think it's particularly competitively priced, I will say.

But I think that insurance is not that expensive compared to the cost of the house. Because as you were saying, Rebecca, they have pretty good information. So this is a pretty small risk.

So the only point I'm making is that actually-- first of all, I love this example because I still can't get over the fact that this is how this actually works. But I think the broader point here is it's not just-- you have to think about the whole set of institutions in their entirety and how all the different pieces of them work together. This not super great deed works reasonably well as part of a three-part process where you have these reasonable deeds, very good records, and title insurance for the third piece of it. And so I think the institutional details are really important. And if you try to understand them, they're important for understanding them if you're ever going to do anything in this context.

Another thing which, by the way, is also kind of-- let me make one other general institutional point. You may think that why would there be any possible downside to land titling? It seems like of course, we should issue really good titles.

However, let me just point out that the process of actually going through and titling land is very, very complicated. So if you're in a world with informal boundaries or whatever, and you're going to title them, everyone understands that whatever titles get marked down and delineated are going to be actual land border definitions now and forever. And so every possible dispute over every possible border has to be adjudicated and settled before the titling is done.

So you might imagine that there's lots of borders that we don't actually need to really worry about. It's kind of like we have our land, and there's kind of some forests in between, and we kind of know roughly where the thing is. And that's fine for a lot for us because you and I don't actually particularly care whether the border is on this side of the table or a foot over here on this side of the table, because it's approximately the border and we're good. It seems like it's fine.

But if the government is going to come on and say, this is the answer, every single one of those disputes has to be adjudicated. So in some sense, you move from a world where disputes are only adjudicated in the small set of cases where they actually matter to a world where you have to actually adjudicate everything up front. And that could be costly. I'm not saying, by the way, it's not worth it. I'm just saying it's worth thinking those things through.

There are other issues that, if you're interested in this stuff, get kind of complicated. For example, another reason why we have these crazy deeds in Massachusetts is there's a common law principle called adverse possession, which basically means if I'm using land for a certain number of years, and no one has explicitly given me permission to use it, no one's stopped me from using it. I just kind of do it and nobody says anything.

After a certain number of years, that land actually becomes mine. That's a common law principle. And so actually, another reason we have the crazy deeds, we don't know actually what's happened with all that usage stuff. And in fact, there would be reasonable reasons to have those kinds of things to formally recognize things that have been happening over time.

So my only point is I actually think that the details of how do you do all this titling are probably a lot more complicated than you might at first think, of oh, it's your house. I sent you a little deed. Write down, we're done.

The actual process of doing it is interesting. And I suspect there's probably some interesting and good research to be done on the details of how do you do that. There could be really interesting papers on the adjudication process.

I, at one point, wanted to do a paper on the adjudication process. And how do you actually get communities to agree on what the titles are? And maybe if-- how does the political environment affect kind of that adjudication process?

I think there's lots of interesting stuff there. So I just wanted to mention that before I talk about it a bit. Yeah, kind of,

AUDIENCE: When you're thinking about this and the risk of the limited liability stuff, is it like that we are sure that land is being used inefficiently in developing countries, and we're trying to figure out why that is? Or is it like there are these problems?

BEN OLKEN: I'm going to talk a little bit about that later. So let's come back to that at the end of this lecture. Let me see if some of the papers I'm going to answer solve your question-- answer some of your questions. Because there are at least a few that are going to show inefficiency. Yeah, question?

All right, so now, I want to talk about the four-- after my little aside-- the four institutions, the four little pieces, four pieces here. What are the impacts on investment, on effort to prevent expropriation, misallocation-- which is a bit kind of related to-- sorry, on inability for collateral. I think all of these, actually in some sense, are trying to answer versions of the efficiency consequences question.

Only one of them is like the wrong people own it. But all of these are saying on net, does all this stuff have inefficiency consequences? Not necessarily because of moral hazard, but in general.

And I think the answer to your question, I think the point of that [INAUDIBLE] paper that we read last time was that does show the efficiency consequences of the sharecropping arrangements associated. That was kind of the point.

So the first thing I want to talk about is investment and how does investment change with better property rights. So Goldstein law, we're going to study a land demarcation paper in Benin. Now note-- this is not the titling piece. This is the demarcation piece.

So I don't think they actually then fully title everything, but they're just going through where exactly are the borders piece, and let's all agree on that. But you can think of this as part of the process of moving towards clarifying property rights. And there's an expectation this will form the basis of a future property titling, but they haven't actually done that at the time of the study.

Now, what I want to talk about for a sec here is this experimental design. So take a minute and have a look at this. And if you can't read it, hopefully, you still have your handout from last time because this is reproduced in the handout.

I want to compare the experimental design they did on the left with the experimental design that one could have done on the right. And I will put as an aside, I put this up there because I put this once as an exam question, and I felt like people did not fully know the answer. So I decided it should go in the lecture rather than on the exam.

So what do you think? What's the difference between these two experimental designs? So what's different about these two experimental designs?

It's a randomized experiment. We're going to randomize these two different-- we're going to randomize villages into the getting this kind of land titling treatment or not. And let's forget about this.

I don't remember what this EMICoV thing is exactly. Let's forget about this. I think it's actually not essential to this, not central. So what's the difference between these two designs? OK, go ahead, Christine. I haven't heard from you in a while.

AUDIENCE: In the left hand, you're working only with villages that are interested. And on the right hand, you are working with villages that are both interested and not interested.

BEN OLKEN: No. Well, not really. So what do you mean, working with?

AUDIENCE: I mean, [INAUDIBLE] people only from a subset of people that self-selected and be interested in this design.

BEN OLKEN: On the left one.

AUDIENCE: Yeah. And on the right hand, you have controls that could be either inclusive or not. And [INAUDIBLE] people that are interested or not interested.

BEN OLKEN: Correct. Yes. I think that is the main difference. [INAUDIBLE] Same thing?

AUDIENCE: Oh, I guess yeah, you might only be interested in the population of villages that are interested and informed anyway. So if you're looking to find a treatment [INAUDIBLE].

BEN OLKEN: Yeah, that would be interested population. Yeah, Pablo, what do you think?

AUDIENCE: The last piece is the eligibility part. So on the left-hand side, there are eligible villages that are interested that are stratified into treatment and control groups. Whereas on the left-hand side, once you're in the treatment group, if you're interested and eligible, you're always going to be treated.

BEN OLKEN: You're always going to be what? Sorry.

AUDIENCE: You're always going to be treated if you are interested and eligible, and [INAUDIBLE] treatment [INAUDIBLE].

BEN OLKEN: Yeah, so how we deal with interest and how we deal with eligibility, we deal with them at different stages of this design and before-- so now my next question-- that's the key difference. So which is better? Which is the better design?

AUDIENCE: The one on the left seems better.

BEN OLKEN: Sorry, what were you saying?

AUDIENCE: Doesn't that depend on what effect you are trying to estimate. Because treatment group is the same. Control groups will be different.

BEN OLKEN: So Ahmed says maybe it depends on what you're going to estimate. [INAUDIBLE], why do you think the left one's better?

AUDIENCE: So you are-- I mean, the classification of knowing what types of people are in the control group, you don't know because you're not measuring this.

BEN OLKEN: Right, you don't know who's over here.

AUDIENCE: And also, you're getting pretty intense selection effects on the right side.

BEN OLKEN: OK, so when you say selection effects, what do you mean? So does this give you the right-- are both these designs internally valid?

AUDIENCE: I suppose.

BEN OLKEN: Let me ask you a question. So do these designs differ in terms of their internal validity or external validity? Let me ask those more simple questions. Sorry, Patrick, you had your hand up. I'm sorry.

AUDIENCE: I mean, it was just addressing which one was better.

BEN OLKEN: I'm sorry?

AUDIENCE: It was just addressing which one is better.

BEN OLKEN: Which one?

AUDIENCE: I think if power is not an issue, I'd say the right-hand side.

BEN OLKEN: But we live in a finite world, so which one do you think? We have finite number. We've got a finite number of villages. Let's suppose we have 600 villages over here, or 1,000 villages, finite number of villages. Sorry, what were you saying?

AUDIENCE: Probably for the right-hand side, are we going to just calculate average [INAUDIBLE]?

BEN OLKEN: Sorry, you guys speak louder.

AUDIENCE: For the right-hand side, are we just going to calculate the average differences between the treatment and control? Or are we also [INAUDIBLE] the control group actually [INAUDIBLE]?

BEN OLKEN: So how are we going to estimate this? So on the left-hand one, we can run y equals alpha treat plus epsilon. And on the right-hand one, we could run an IV regression.

Because not everyone on the right-hand one-- not everyone lotteried into treatment will ultimately get treated. So that's a nice case to run IV. So we can run IV where we can run y equals alpha treat-- alpha get the treat, get treatment, plus epsilon. And we can use the lottery as an instrument.

So my first question is, are these different in terms of internal validity? So I think the things we want to think about are-- one is, are these internally valid? The second is external validity or what LATE does alpha estimate? And three is what's the power? What's the system power here? Yeah.

AUDIENCE: [INAUDIBLE]?

BEN OLKEN: Who knows? Let's just say it's something. I don't remember. Let's say it's something that you can only investigate if you go to the village, and do something, and talk to people, and do some stuff. So say it requires some digging around to figure out. Yeah, Reika.

AUDIENCE: So I think on two, it kind of is contingent on whether you think that this policy could be implemented in the event that a village wasn't interested, and also what drives the village to be interested or not. So if you think that it's just going to be categorically impossible to ever implement this in a population where people are not interested in taking up the treatment, then it's not interesting to you. What would measuring the effect in that population? Because it's like you can't implement that policy.

BEN OLKEN: So I agree. So if you never implement this policy in villages that we're interested in, then LATE is not interesting, the LATE of what would be the average human factor in the entire population is not a relevant LATE. Well, you're saying something else?

AUDIENCE: Oh, yeah.

BEN OLKEN: But we have another question, though. So does the left-hand side and the right-hand side-- do they estimate the same LATE or differently LATEs?

AUDIENCE: Are you [INAUDIBLE] the population of-- are you including when villages say that they're not interested in the treatment?

BEN OLKEN: Here?

AUDIENCE: On the right-hand side [INAUDIBLE] control group.

BEN OLKEN: Yeah, of course. So how do we estimate-- how do we run this regression? So how do we run this regression?

So in this regression, let's forget about the eligibles, whatever, just to make the life more simple. I take these people over here, only these people, and run a regression on treatment and control. In this one, I have to condition on what I randomize. So I take all these people and I compare them to all these people, so I have data, so I do all that. So that's using the regression.

AUDIENCE: [INAUDIBLE] So they're not measured in the same way?

BEN OLKEN: They're not measured in the same way. Why?

AUDIENCE: Because first, you've cleaved into-- in the only villages that are interested and informed, and then your treated versus control populations going to be conditional on being interested and informing. In the other case, you're looking at all villages, and then you're just inducing an incentive to get treated, and comparing that against a control population that includes people who are not interested.

BEN OLKEN: Yeah. So it is definitely the case, the sample here is very different. This includes all the people who are interested or not interested. Does anyone disagree? You disagree? Yes, no? Yeah, Paolo.

AUDIENCE: But then if you do like the classic IV thing of how many of the people actually took it up, then you get the LATE exactly for the people who took it up.

BEN OLKEN: Yeah, so say more.

AUDIENCE: So if you take the average from-- for the alternative design, the difference between the left branch and the right branch, and then you divide it by the percent of people who took up the treatment, then you would get the coefficient for the treatment effect for the people who decided to take up the program, or the villages.

BEN OLKEN: Right. So actually, I agree with you, Paolo. So they are different samples, but they're going to get you the exact same LATE. So why are they going to get you the exact same LATE?

Well, there's this control group, and I agree with you-- that's going to have lots of people who aren't interested in there. But none of those people are going to take it up if offered. So we've got a bunch of controls who don't do anything.

So who are the people who are in this treatment group-- and you compare everybody over here, everybody over here. Who are the ones who are going to get the treatment? Well, the only ones who are going to get the treatment are the ones who are interested and eligible.

So over here, we're comparing a change for the interested and eligible group, and no change for the not interested or not eligible group, to some kind of weighted average with the same proportions of interested and eligible people, but with no treatment effect. So the only difference between this group and this group is the interested and eligible people get the treatment and the interested and eligible controls do not get the treatment. Otherwise, these are the same.

And over here, it's exactly the same set of people. We're taking the interested and eligible, and we're comparing the ones who get the treatment to the ones who don't. Now, we have a bunch of people. In this sample, we have a bunch of people who are in the treatment group who are not eligible and are not interested who don't get treated, and with the analogous people in the control.

And that's why we have to use IV. If you compare just the reduced form estimates, they would be different because you've got all these people who aren't doing anything. But the relevant set of compliers is exactly the same. Yes.

AUDIENCE: So then is the difference--

BEN OLKEN: Oh, I'm sorry, let me say one last thing. Under the assumption that being offered the treatment and turning it down, like over here, is no different than being asked over here. So under that assumption, they are identical. Sorry, go ahead.

AUDIENCE: OK, so then is the difference that on the right-hand side, you're ex ante throwing away a bunch of people that could have otherwise been in your estimate?

BEN OLKEN: Useless people. You're throwing away useless people on the right-hand side. So you're-- I mean, by useless, I mean, obviously-- sorry-- useless for the point of view of estimating this regression. They have many wonderful uses in the world, obviously, but for the point of view of this regression, they are just nuisance.

They are people who are in your treatment group and in your control group, but who are never takers. So they're never-- they're just in-- but the problem is in this design, in the control group, you don't know who the never-takers are. So we can't drop them. We have to include them in the treatment group and the control group. Sorry what were you saying?

So yes, so what this design allows you to do is figure out who the never-takers are and drop them from the sample. And in this design, you can't do that because I don't know who-- I know who the never-takers are in the treatment arm, but I don't know who the comparable never-takers are in the control arm. So I have to include all of them in the treatment group and all of them in the control group for them to be comparable. Yeah, Aaron.

AUDIENCE: There's one question on this, though, is, from the standpoint of experimental design and thinking ex ante, on the right-hand side, we're doing this randomization before we talk to any villagers about their level of interest. So there's a risk that we do this treatment assignment, and then we go, and there's two villages that are actually interested in taking that.

BEN OLKEN: Which one, the right-hand side?

AUDIENCE: The right-hand side. So that's just, I guess separate from this issue of who are never-takers. I guess this falls into the bucket of power, that you're running the risk that, based on how you've constrained yourself from the start of the experiment, you might--

BEN OLKEN: You might not have enough people. Yes. Yes.

AUDIENCE: Whereas that's not an issue--

BEN OLKEN: That's also true.

AUDIENCE: --on the left-hand side.

BEN OLKEN: Yeah. So is everyone agreed? Yeah, [INAUDIBLE].

AUDIENCE: Just like [INAUDIBLE] maybe like in the right-hand side, maybe it makes sense because it would be more expensive and you're including people that you shouldn't include. But if you're doing the left-hand side, maybe you should be careful to see how many people [INAUDIBLE] because maybe giving different [INAUDIBLE] was only for people that were interested in the [INAUDIBLE].

BEN OLKEN: No, sorry. I'm sorry, I don't understand what you're saying. So sorry. Say it again.

AUDIENCE: I guess there's no external validity. And you have to be careful with the first version because maybe not enough people would be interested.

BEN OLKEN: No, external validity is the same. So external validity is identical here. That's what I was saying, you get the same LATE. So the LATE may not-- going back to your earlier point, the LATE may not be the LATE of what would the LATE be if I was able to persuade everyone to do this program. But LATE in the left-hand design and LATE in the right-hand are the same.

AUDIENCE: I think Paolo's saying what if just very few people in the country are interested. And then, at least you see that not much is happening in the right-hand side. And then on the left-hand side, oh, wow, in these four villages that were interested, something happens. But then--

BEN OLKEN: No, no, but you know that, too. You have this information over here. You know what facts people are interested.

AUDIENCE: I guess I'm saying that you have to take that into account. And then just like [INAUDIBLE].

BEN OLKEN: Yes, you certainly have take it into account. Absolutely. But that piece of data you get in the same, both designs. Yeah.

AUDIENCE: So on the right-hand side, if you were to then go to all the control villages and inform them, and then be, like, are you interested, and then just do nothing, do these become the same again?

BEN OLKEN: Well, the problem is in reality, you can't. It's not quite credible. If you're going to inform them and then be, like, oh, sorry, you're not going to get it, the question is-- you have to be able to-- you want to basically inform them in exactly an identical way. So it's not the same to say, are you interested, and if so, we're going to do the program today, versus hypothetically speaking, if we did this program, would you be interested in it. Those are different questions.

AUDIENCE: Well, couldn't you ask the one-- I see. And then you have to ask the same question to the--

BEN OLKEN: And that gives you the left-hand side.

AUDIENCE: Wait, if you were asking people on the right-hand side of the left wing, hypothetically, if we had this program, would you be interested, and then also asking the right-hand side. But it is the same thing.

BEN OLKEN: Yeah, but that is the left-hand side.

AUDIENCE: Yes. It's the same thing, right, the [INAUDIBLE] measuring the right wing of the alternative.

BEN OLKEN: If you're doing it exactly the same way, then that's this design. OK, so does everyone agree? So they're both valid internally.

They actually get you the same LATE. So which is better? Are they equal or is there a strict one that's better or worse?

Someone else? Somebody else? Nobody else I haven't heard from? What do you think? Yeah.

AUDIENCE: I mean, my intuition is if we are estimating the exact same thing, we would rather have less than IV.

BEN OLKEN: Why?

AUDIENCE: IV standard errors are always much larger because they're fighting two estimates by each other. So like [INAUDIBLE]. So I don't have [INAUDIBLE].

BEN OLKEN: Yeah. What were you gonna say?

AUDIENCE: I was in similar set-- power.

BEN OLKEN: Yes. So yes, you're right. So yes, your power is going to be greater in this one and this one. And one reasonable way to think about your power is that your power-- you can think about your statistical power as like the t-test on the reduced form.

And the t-test on the reduced-- because in some sense, both cases, you're estimating your reduced form. And in the IV, you take the reduced form and divide it by the first [INAUDIBLE]. But in some sense, your power is never going to be better than the reduced form.

Your statistical precision is never going to be better than your-- your t-stat is never going to be better than the reduced form t-stat because you're taking that and then dividing it by something that's not perfectly estimated. So which of these has a better t-stat on the reduced form? Well, here-- sorry, I probably have to write this down.

OK, so on the right-hand side, let's suppose that fraction alpha are interested. And beta is the treatment effect. So what's my t-stat?

My t-stat is going to be-- for the right-hand side, I don't care about this because I'm only restricting my sample to people are interested. Sorry, my t-state is going to be rough and N is the total sample, total number of villages. So what's my t-stat? It's roughly going to be proportional to beta divided by alpha, the square root of alpha times N.

So your standard error is proportional to the-- so t-stat is beta divided by the standard error. Standard error is proportional to the square root of the sample size. So my sample size, I've reduced by alpha because I had to-- [INAUDIBLE] my alpha because all people who aren't interested, I chucked them out.

So my reduced form t-stat looks something like this. Now, I'm sorry, this is the left-hand side. Now, on the right-hand side version, my t-stat is going to be roughly equal to-- well, I got everybody in there, but only a fraction alpha of them have a treatment. So it's roughly equal to alpha times beta, and I have the full sample.

So you can see that this one-- did I do this right? I did something wrong. Hold on. No.

My standard error is proportional to 1 over the square root of the sample size, sorry. Bigger sample size means a smaller standard error. Yeah, there we go. Sorry, that's correct.

So what is this? This is proportional to root alpha beta times root N. And this one is proportional to alpha beta times the square root of N. So the t-stat is going to be much bigger on the left-hand version rather than the right-hand version.

And why? It's because of the question of, do I want to reduce my power? I have the same kind of alpha problem, and do I want to deal with it by just having a larger standard-- by reducing the first stage or by reducing with or dealing with more sample size?

And the answer is, because of this square root of N thing, your power is going to be left better if you can deal with it upfront, rather than just you have to estimate it. Is that clear? No? Kadesh, you look confused. No?

AUDIENCE: Yeah, sorry, why is that? Why are we comparing alpha N to N? Wouldn't we have the same sample size?

BEN OLKEN: No. So in this example, remember I said, suppose we had 1,000 villages over here.

AUDIENCE: OK, it's not like 1,000 villages to work with in the experiment.

BEN OLKEN: I have 1,000 villages total that I can work with. And my question is, do I want to screen them out ex ante or screen them out ex post? Same 1,000 villages, and my point is that it's even better, by the way, if I have 1,000 villages to survey.

That's way, way better over here. Because I don't even have to-- then it's just like beta times root 1,000. Over here, it's beta times whatever, alpha root 1,000 or whatever, or alpha beta times root 1,000. So it's way better.

If I can [INAUDIBLE], it's way better. I was making a harder case for myself, where I only have a fixed number of villages up front. And my question is-- and so where there's a cost on the left-hand side of having a smaller sample over here.

And I'm saying, even then, even with a smaller sample, a smaller amount of data, I still want the left-hand design. Yeah.

AUDIENCE: Can this intuitively be thought of as on the right-hand side, you are meaning to estimate alpha, whereas on the left-hand side, you don't need to estimate alpha?

BEN OLKEN: No, I think it's not just that. No, because I know alpha. It's not that. The problem--

AUDIENCE: You do know?

BEN OLKEN: Yeah, because you know how many people [INAUDIBLE] treatment. So alpha just--

AUDIENCE: On the right-hand side?

BEN OLKEN: No, well, it's statistically the same. So--

AUDIENCE: I see, I see. [INAUDIBLE], right?

BEN OLKEN: Yeah, but I don't think that's the issue. I think the issue is-- I think really where this comes from is on the right-hand side, I don't know who the compliers are and who the never-takers are, and I have to lump them all in together. Whereas on the left-hand side, I know who the never-takers are for sure, and I just get rid of them for my sample. And that's where I think the real efficiency gains are coming from. OK, Clear?

So that's why it is always a good idea, if you're ever doing this, to do as much screening as you can before the randomization so that your first stage conditional on randomizing people to treatment and control-- your first stage is as close to 1 as possible. It's always better to do that screening ex ante, or in general, it is better. Clearly, I'm talking a lot because my computer keeps turning off.

So my final question that I wanted to ask, and as I said, writing exam questions that people seem confused about is a good diagnostic for things that should be taught in lecture. I try to avoid doing that. But every once in a while it happens.

My final question is, is there a reason that you would prefer the right-hand design? And I will try to get my computer back so it can show you the right-hand design in a second. So I just told you all the reasons the left-hand side design is better because it gets you the same internal validity, the same external validity, but much better power.

Is there a reason you prefer the left-hand design? Yeah, Paolo, what do you think? No, prefer the right. Is there a reason you prefer the right? Sorry.

AUDIENCE: You do half as much screening and so your cost will basically be half.

BEN OLKEN: Yeah, exactly. So if it turns out that the screening step is super duper expensive, then you might want the left-hand side. Because here on the left, I've got to screen everybody. And on the right, I only screen the treatment group.

So if it turns out that that step is-- so the other thing you have to do in practicing different design is you have different costs at different levels. So there's a screening cost and there's a data collection cost. And sometimes, your data collection is really expensive, like I'm going door to door and running a survey. That's really expensive.

Sometimes, your data collection is free, like if you're getting admin data and you just get all of it for free. There's no cost there. And actually, maybe screening people is costly.

So in practice, if the total number N here is maybe large, but these different steps have different costs, that you have to think through the costs in this. And that's, I think, the one caveat I would make to this. Clear? Questions? OK, all right, so that's mostly what I want to say about the experiment design. I thought this was a nice example

OK, back to land reform, back to the land titling, substantive. So what do they show? So the first stage-- so even here, by the way, their first stage is not-- or the impact on clear borders or whatever is not 1. So going through this whole process only increases it by 1/3 or whatever, or by 1/4. That's fine. It's whatever.

But then, they actually do look like they find some impacts on things on tree planting and perennial crops. And the idea is these are things with very long time horizons. So I plant a tree. I need to know that A, I'm going to still own this land when it's time to collect the crops from the tree, and B, no one is going to come and cut down my tree.

And so that requires pretty good property rights and clear borders. And so same thing with-- perennial crops come back year after year. So these things suggest that the clear property rights actually do change my time horizon, and that they lead people to take these longer term investments. And so that shows one type of inefficiency from having unclear borders. OK, clear? Questions? All right.

So that was number one, substantively [INAUDIBLE]. This was investment increases with good property rights because of this time horizon point. Investments are I pay a fixed cost now, hopefully returns in the future. If I own the thing, I'm going to capture those returns. But even if I sell it, I still capture the returns in the sale price. So I make these longer term investments. Great.

Second question is, do I have to do inefficient actions in order to protect my property rights if they are less clear? So if my property rights are bad, maybe I have to do things inefficiently to protect the property rights or to give me better property rights, I can not take those inefficient actions. So here are some examples.

So this is one from Ghana, where people have weak property rights on plots. There are competing claims to the land, whatever, there's a lineage thing and the village. And it's never quite clear, as they argue in the paper, whether you have the right to farm this land or not. It's unclear.

And in particular-- so as you may know, you want to leave your land fallow or not farm it every so many years to allow the land to regenerate itself. But the problem is, if I'm not actively farming the land, someone else may say, well, that land, you're not using that land. I'm going to take that land.

And so in this context, the idea is that fallowing your land is a risky thing to do if you have insecure property rights. And so the idea here is, what they want to say, is people who have power in this relationship, or in this area. They are the ones who are less worried about their property rights.

It's not a land titling paper. It just says in this event of who-- if I'm really powerful in the village, I'm not really worried you're going to take my land because I can boot you out if you did that. But if I'm not very powerful, then that's a real risk for me.

And what they argue is that the people who are not powerful don't fallow their land as much for this reason. So that's the argument of the paper. So they show, for example, that office holders fallow their land. Inherited people fallow their land.

And so I'm not going to go through that in a lot of detail. I think the question you want to think about if you're thinking about this paper is, what is this correlated with? And what are the human variables?

And let me not go into that. If you're interested, you can read the paper. But the point is, this is one potential example of a kind of inefficient action people could take.

Another one that I want to talk about in a little bit more detail is this paper by Field in Peru. This is a land titling paper. So in this period, basically, they rapidly start issuing titles.

And these are actually urban, going to be urban households. So you can think of people in kind of less formal areas, maybe in slum areas, who don't really have clear title over their lands. They're going to go through and title all these places.

And they want to say, does just the act of getting that title and having that clear property rights mean that you no longer have to stick around the house to protect your house? That's kind of the idea. And it's going to be a different diff, basically.

So in this paper-- it's basically like areas that get the title-- diff in diff. Areas get the titling program versus areas that don't get the titling program or haven't had it yet, and people who had titles to begin with who shouldn't be affected versus the ones who were untitled to begin with. So that's kind of the diff in diff.

So lo and behold, the titling program gives you a title, probability 0.78. That says the program kind of worked. And it reduces your risk of eviction or property invasion substantially, at least your perceived risk.

So it looks like people are updating about their risks based on titles, and so forth. Or do I consider it secure? That goes up.

So in general, it seems like this is changing people's security about their houses. And the question is, what does this do to their labor market outcomes? And in particular, what you can see is they-- so what happens is they basically they end up more in the labor force.

But I think what's more interesting is why. And in particular, these kind of things are, I think, actually, to me, the two most interesting results. They're am I using my residence for my economic activity? Do I kind of have to work from home because I need to be home to protect the house? That goes down with titling.

And do people have really long commutes or are they kind of going really far away for work? That actually goes up. These are in urban states where people aren't actually selling their land.

And this is not a case where the title let me sell the house and move somewhere else. What this case is doing is saying, there are good opportunities really far away in this big metro area, but I have to leave my house alone for the day and be confident it's going to be there when I come back. And they show that that goes up with better titles.

And so the implication of that, also, is that the titling was causing an inefficiency-- the lack of titling was causing inefficiency because people weren't able. These were jobs they clearly prefer, might reveal a preference, but weren't able to do because they were worried about protecting their houses. Yeah.

AUDIENCE: [INAUDIBLE] we studied land [INAUDIBLE]. Is [INAUDIBLE] global data very critical to this kind of thing [INAUDIBLE]?

BEN OLKEN: Yeah, so it's a power question. So could you run-- suppose this thing was randomized so we didn't have to worry about pre-trends or any of that stuff, so we just had titled areas, non-titled areas. If you had enough of them, you could just compare in general, what happens in the titled areas, what happens in the non-titled areas.

I'm thinking. Actually, the ideal thing, I think, would be to say, either at the house level or the person level, and the place where it's a little complicated is if you have-- so you either want to track what's happening to houses as kind of a unit, or what's happening to people kind of as a unit. What you might not want to do is track people in location.

So you might not want to kind of do a cross-sectional ex post interview of who happens to be in that house at the time because that could be-- because people could swap back and forth between the places. So you see what I'm saying? So I think what you really want to do is--

AUDIENCE: [INAUDIBLE].

BEN OLKEN: Yeah, I mean, it's a thing, like what happens-- you're asking questions about the land. And that's-- yes, I mean, with the caveat the whole city is operating in general equilibrium. So an even better case is if you have isolated cities that are separate from each other.

So if you're in a world where the city is in-- so for people, I think you're in good shape, ex ante people tracking them over time, that's fine. If the-- no, I guess if the city is in equilibrium, that's fine, too, actually. You're going to get what is the-- I think, the city actually, that's probably OK. Because in the pre-period where they're not titled, you're going to get-- you're going to read off what is the difference of the marginal return to this property being titled.

So that's still valid. But yes, you do, I think, want to think through. If you're asking equilibrium questions, what are the equilibrium [INAUDIBLE]? Other questions? Yeah.

AUDIENCE: In this kind of things, why don't you see more [INAUDIBLE] insurance structures?

BEN OLKEN: More what?

AUDIENCE: More insurance company, maybe pricing, maybe provided by the powerful individuals to provide--

BEN OLKEN: Insurance.

AUDIENCE: Yeah. [INAUDIBLE] if you'll go away, I'll guarantee you that no one's going to take over it. And if they do, I'll give you some money for it.

BEN OLKEN: It's a good question. So that's actually really interesting. So I don't know. I mean, and you do hear about protection payments, for example, by informal-- often, they end up being by gangs and things, which are maybe better able to be in the business.

The problem is the formal sector can't really do it because you don't have the formal title. So it becomes really tricky to be, like, what are you-- doing this thing through the form-- I think providing this kind of insurance through the formal sector is difficult if you don't have title because the formal sector needs paperwork, basically. So I don't know of any.

I could be wrong. I don't know of any examples of the formal sector providing insurance against evictions for squatter, for people who don't have formal title. I could be wrong and that would be super interesting, actually, if you found examples of that.

I do think there are all these informal institutions, like gangs, for example, which on the one hand are just taxing people. So they're providing that. So a lot of those payments are just pure straight rent extraction.

But they sometimes are offering services in exchange for that. And because they kind of operate more informally, they can maybe enforce these things kind of more informally. I don't know of any examples where informal institutions like that are providing either good property protection against expropriation or insurance.

But I think that would be, if you found one, that would be super interesting to study. I think it's super cool. No, you're right, absolutely. Other questions or comments?

OK. All right, so number three in our list of what are the problems with poor property rights, is misallocation. I think somebody asked about that. So in principle, tradable property rights should lead to efficiency improvements.

That's kind of the Coase theorem. As an aside, we have a current grad student who's actually working on some of this stuff in the context of fisheries and tradable fishing permits, exactly kind of asking these kind of Coase theorem questions.

What about land? So this is another paper where I'm looking for a great land Coase theorem paper. I'm going to tell you about two that are relevant, but I don't think quite have exactly what we want here. But let me tell you the two papers that I know of that think about this.

And also, I should say, by the way, I'm always open to, oh, Ben, you forgot about this paper. So if there are papers I should be aware of, always let me know. There's a lot to keep track of.

So one paper that is not particularly well known but I happen to it because I think it has a very clear question is this paper by Ravallion and Van de Walle about Vietnam. So Vietnam was a strict communist country at one point, and then had a bunch of reforms and relaxed some of that, and allowed more tradable, more things that look more like ownership properties. So in particular, they're going to study the introduction of private tradable land in Vietnam.

So it used to be the land was allocated by the government, couldn't be traded. And then it becomes tradable. And they want to argue that basically after privatization, what happens is the high-productivity farmers end up with more land, which you would expect in a standard kind of Coase theorem logic.

I'm a good farmer. You're a bad farmer. I should buy your land-- to some point.

If there's kind of concave-- if land productivity is concave in size, then I shouldn't necessarily buy all the land. But on the margin, we should see an allocation of the-- if we all have the same amount of land, the marginal productivity of the good farmers would be lower than the low farmers. So that's not an equilibrium. We should have more land to the-- in equilibrium, where we allocate, we equalize marginal products of land, should have more land for the higher farmer's standard [INAUDIBLE].

So how do they do this? Well, they do this structurally. And they say, in the pre-period, they estimate some characteristics that make you a more productive farmer.

Then they write down a functional form where basically, they have this kind of C function, which is saying that the C function is the productivity function as a function of how much land you have, and how much, and the X characteristics. And they write it down parametric like this in logs, which means that in levels, these things are complements. So people with more X should have more l in that functional form.

And so if this b coefficient is less than 1, this is concave in land. And we get the interior solution, what I basically just described, that basically, you have the people with better X's are the ones getting more land, but they don't get all the land. And so they then test whether land allocations increase with this kind of predicted optimal amount of land, which is all function of their X's.

I think this is a very structural kind of approach to this. It requires getting these X's kind of right. And it also requires other admitted variables that are correlated with these X's.

So I don't think this is perfect. For example, there could be other things, like for example, the X's might influence the production function. If I'm politically connected, maybe I look like I'm a good farmer because I can sell at high prices and maybe also get some output.

Other things could be changing besides property rights. It's kind of just like a diff, essentially. I mean, it's a different diff by the l star thing, but there could be other things that are changing that change the allocation of land.

A big one is actually they're-- the reason this is the C, this is actually consumption, not production. So that's a little weird. It's not necessarily what you want. And it's a very functional form of production, so very functional form dependent. It's very, very simple functional form.

So I'm not going to go through this in a lot of detail. But I think that in principle, though, this is a cool idea to say, look, here's what the efficient allocation would look like. We relax property rates over here, not over here. If we had that extra diff, does the allocation move more in the direction of more to the high TFP focus? Yes, Kadesh.

AUDIENCE: Would it be a less structural approach to [INAUDIBLE]?

BEN OLKEN: Well, it's a good question. Maybe it's not so much that it's structural. Maybe it's all these data issues and not having a second diff.

Maybe that's the problem. Maybe you're right. I mean, at some level, you're right-- you do have to estimate. Well, one thing I could do, for example, is I could not protect it on X's.

AUDIENCE: I'm sorry, how does that work?

BEN OLKEN: OK, fine, it's a very fair question. So I could estimate individual farmer fixed characteristics and say, I could just take the production function-- I could estimate that the farm production function, and then a farmer fixed effects, and the farmer fixed effects is kind of your residual TFP. And then, I could see whether individual farmers who seem more productive get more land when they free it up.

That would be a less-- it's still parametric in that I have to partial out other stuff to get your piece of it, but that would be one way to do it. So another way to do it would be to-- it's not perfect, it's got other downsides, but to say, look, I'm going to estimate the average productivity. I could take something simple.

I could do average productivity of land. Maybe that's the same. It's the same as the X's. So maybe that's the answer. Is it A, better data, B, an extra diff, and C, I think maybe a richer structure where I don't load it all into a couple of X's maybe would be better. Fair question, though, fair question.

But what do you see? The basic point is the land deficit is l star over-- these are the people that should have more land. This is like l star over l, optimal land compared to actual land.

And this is the change in land during the reform period. So in general, just says during this five-year period, the people who we predict to get more land do actually get more land. So it suggests it's reallocation in the productivity dimension, with the caveats I mentioned.

The last thing I want to say for today is that this Coase process, this reallocation process, can take a really long time. And here's a nice example of this. This is a paper by Bleakley and Ferrie.

It's called, "Land Openings on the Georgia Frontier and the Coase Theorem in the Short and the Long Run." So this paper studied land allocations in the US State of Georgia. And the frontier in Georgia-- this was a long time ago if Georgia was the frontier.

For those of you who know, the US was settled, approximately settled, certainly from coast to coast, mostly from East to West, with some caveats, by the colonists and so on. So the frontier was opened by the US government to settlers in waves heading west. And different waves used different parcel sizes.

So at some area, I think they get 40-acre parcels, and they get 160-acre parcels, or something like that. And there's a discontinuity of the border between which of the areas where it was divided into big plots and the area where it was divided into small plots. And they argue that in the long run, if the Coase theorem is true, the optimal plot sizes should converge to the same thing on both sides of this border.

There's an optimal farm size in Georgia, and we should buy and sell farms to get to the optimal farm size. So the initial allocation of big farms versus small farms shouldn't matter in the long run. And the question is, how long is the long run? That is the question of this paper.

And the answer is, the long run's about 100 years. So they trace the parcel size across this border over time, and it doesn't really converge till almost 100 years later. So I just want to say that the Coase theorem works, but the Coase theorem is slow, was the point I wanted to make-- so just worth keeping in mind, as well.

OK, I'm out of time. I'll stop here. I'll just finish up the last few things about land.

The paper I'm going to start with very briefly next time is-- I'll talk a little bit about this Foster and Rosenzweig paper, if you have a quick look at it. And then we'll switch to the-- I think the PF lectures are next, on redistribution, are the next ones. So that's what's coming next. I'll see you guys on Wednesday.