

MITOCW | 1. Finance, Growth, and Volatility

The following content is provided under a Creative Commons license. Your support will help MIT OpenCourseWare continue to offer high quality educational resources for free. To make a donation or view additional materials from hundreds of MIT courses, visit MIT OpenCourseWare at ocw.mit.edu.

ROBERT The logistics for the class. Unfortunately, we seem to have run out a bit. So if you could share the syllabus that
TOWNSEND: you have. I'm actually not going to go over it in detail. I do want to give you sort of the big picture of what we're doing.

First of all, I'm glad you're here. And I do want class participation. There will be three problem sets and a research proposal. The problem sets are meant to be practice for you just to make sure you're working through the material.

Some of you take field exams, for example. So these problem sets are meant to be practices for that, as well. It's really meant to help you. One of the problem sets is going to focus on actually getting your hands dirty with the data, so to speak, and Whit's going to help with that and give you access to the Townsend tie data. And we'll have a specific project geared around that.

It's really a research class so, I would like you to write a research proposal. Not exactly a paper-- it can be short. But the idea is that hopefully as we go through these lectures, you will-- and I will try to help this process-- you'll have ideas about things you would like to work on, things where you think the literature is falling short. And you should begin to sort of think about that.

It's all too easy in these courses to think that taking a course means memorizing the lecture notes or learning how to manipulate as in a certain model, and not thinking broadly about next steps. You don't see faculty doing the research, actually. I'm going to try to share with you how literatures develop, compare and contrast different styles, different attack strategies. In fact, the lectures are going to be a blend between overview material and the usual detailed analysis of specific papers. Because that's a big part of the course, I want you to get some experience at trying to think about things that way, as well.

The syllabus does say something about a midterm, which is basically the final for my half of the course. This is joint with Abhijit. But my first gift to you is that we're going to waive that. So there will be no final exam. And instead, the emphasis is going to be on the problem sets, and the research proposal, and class participation.

Before I forget to say, the recitation section is scheduled Thursdays. I had originally thought it was Fridays. So we put To Be Determined in all those recitation sections. And in fact, by this Thursday noon-- just after this class, essentially-- you would have already had your first recitation section. But it's just too early, so we're not going to meet on Thursday. But we will start in earnest the following week.

And if you start looking at the syllabus, you will see that there's a section at the beginning on data, which I've kind of already mentioned. There's a section at the beginning on computation, and also on the GIS. So if you want to think about those as tools or skills, we're going to have some TA sessions going over sort of some of the computational aspects, for example, after the lecture on Thursday. Though it will be obvious how a computational recitation section fits in.

Now I recognize I don't want to overdo this, but the more I've talked to many of you, the more-- including yesterday, actually, in some sense, and advising of second years-- the more I realized that students like you want to get trained in computational skills and methods, and so on. So we can have some extra sessions. I'm in the busy-- in the process of setting up extra computational sections on how to solve certain problems.

We'll probably make up for the lost TA session on Thursday. And Whit, in fact, is going to send out an email to each of you to try to work on scheduling a backup time. So if we have some extra sessions, we'll try to have as few conflicts as possible so you can come.

So I guess the only thing I want to say about the syllabus that won't be obvious from the lecture is today is the introductory class, and there's all this supplementary material. And then on Thursday, we'll start with Lecture 2. You'll get a dose of these sort of micro-founded macro models.

We're going to go on to another sort of new wave of those models featuring limited commitment and collateral constraints on the growth TSP type issues. And then another section focuses on basically versions where there's costly state verification, or moral hazard, or adverse selection. So you can compare and contrast the implications of having these different financial underpinnings. Which you know is complementary classes in macro are also getting at those same issues.

Then we'll have sort of the intermediate class on microdata and building all the way from household accounts to national income accounts, and then move to actually using the microdata for various tests so that these models, full insurance, in various ways, then with these obstacles to trade and so on throughout the class. So that's kind of the big picture of the syllabus.

Each lecture is pretty-- a lot of fun. And there's a lot of material in there. The lecture notes are meant, as I've said, to tie the material together both in general, and in its specifics. Today is a little bit of an exception because it's just an introductory lecture. I will try to have all the slides posted. I'm not sure we managed to get this thing posted, but I'll do that. I'll try to get that done right after class.

Normally the slides will be posted in advance of the class. So if you feel more comfortable looking at material, might facilitate asking questions during class, which would be good.

AUDIENCE: These slides are posted.

ROBERT Oh, good. Excellent. And most of the readings are linked, not entirely all of them. So it should be easy to explore your special topic. Are there questions about the logistics of the class? And I'll hang around a bit afterwards to answer any specific questions you might have.

TOWNSEND:

So finance, growth, and volatility-- theory, data, and the formulation of policy. You know, the course is organized around these topics. There's so many ways to think about this. Finance, financial access is a very huge issue in development. You may be more used to thinking about it from a micro perspective. But we not only do the micro, we do the macro.

The idea is that somehow finance helps people with financial services. It may be alleviating poverty, and in the context of these general equilibrium models, it has additional effects. So many countries around the world, not just the World Bank and other aid agencies, are pushing, promoting, advocating, financial access. There's new Gallup surveys measuring this stuff to try to get at inequalities across countries, to sort of push a little bit the agenda. So that's finance and growth. I'm going to say more in a second.

Finance and volatility sort of should bring to mind the recent US and worldwide financial crisis. And it pushes you seemingly in exactly the opposite direction, which is maybe the housing market in the US. Maybe there was a little too much effort for middle or even lower income households to own homes, and that's led to certain government agency financing arrangements. And in any event, it clearly was a financial crisis. And most of the regulations deal with seemingly trying to push us back toward more restricted intermediation, as if financial access, and credit, and financial liberalization might, if not be a bad thing, maybe go too far.

Well, we're going to try to be writing down models that think about not only each of those separately, but to some extent, having it on the same page to try to get at that tension. And actually growth is in there with finance and growth. Growth and volatility is another quote bilateral pairing if you wish. There's some idea that finance causes growth, but growth does not come without volatility, leaving the question I just raised about finance and volatility.

So let me sort of give you a sense of each of these sub-pieces. Finance and growth, well, here's the story, and I think it's pretty well accepted by these three papers, for example, that are very much cited, King and Levine, Rajan and Zingales, and Ross Levine. You can read the abstract, but basically, let's pick out a few things here.

Finance and Growth, Schumpeter Might be Right. Cross country evidence that financial systems promote growth, that the levels of financial development are strongly associated with per capita GDP growth, and capital accumulations and improvements in efficiency like TFP. But furthermore, there seems to be causality in the data, that predetermined level of financial deepening or development are associated with subsequent higher rates of all these good things.

Rajan and Zingales come at it in a related way. They're basically saying that industrial sectors that are more in need of external finance due to the nature of the business develop disproportionately faster starting from a lower level in countries where the financial systems are liberalized or more liberal than in other countries. And they're worried about causality and so forth.

And Levine's review, *Finance and Growth, Theory and Evidence*, the summary in the abstract with qualifications to follow from him. Countries with better functioning banks grow faster, but however, it doesn't seem to matter whether it's bank-led finance or stocks or equity markets. He tries to cover the literature on simultaneity bias, and so on.

So Levine also points out the importance of this question and the importance, therefore, to research. And I must say, in these slides I tried to indicate where there were quotes, but at some point you may find it hard to tell what was the author's statement, which is quite clear here, versus my summary. But I wanted to see-- I didn't want you have to take my word for it. I actually wanted you to see what these guys are saying in their papers.

"Research that clarifies our understanding of the role of finance and economic growth have policy implications and shape policy-oriented research." This is going to influence the priority that policymakers and advisors attach to reforming the financial service sector. And so when this empirical work shows there is the connection between finance and long-run growth, that basically advertises the urgent need for research on the political, legal, regulatory, or policy determinants of financial development.

Note he is not saying that it's a done deal. And he has been one of the lead contributors to this empirical work. But he's saying, in fact, there is much more to do on the research side. Specific policy implications are not immediate. It's not obvious how to go from the general idea of policy to the way that financial systems actually work, and in particular, the way they are modeled at the theoretical level.

So you'll see this over and over again in these lectures, which is this-- and I try to bring out both sides-- which is empirical work seems to mesmerize, if not reassure theoretical work with almost no mention to the data and often this gap in between. I'm going to try to bridge the gap, show you how the literature is trying to bridge the gap. But it's kind of reassuring and refreshing to see Levine being so candid in this rather famous review article.

He says, "What do financial intermediaries really do?" Well, you can think about producing information, about investment possibilities, or monitoring investments, maybe corporate governance is better if they're somebody looking at them, facilitate trading. Facilitate diversification is important when there's risk for sure and the management of that risk. Financial systems at a theoretical level mobilize and pool savings and generally ease the exchange of goods and services. So changes in these functions that are brought about by, say, policy changes could influence savings and investment, and therefore, have influence on economic growth.

Now, then you start to think about what is he really saying or not saying? One thing that sort of caught my attention-- and I was predisposed to look for it-- is this distinction about levels versus growth rates. So is his vision one of steadily improving financial intermediation on one or several of these dimensions, pushing levels of income up, so that an expanding improved financial sector over time is causing growth in the sense that you have ever-increasing levels?

Or is he saying that a once-and-for-all fix to the financial system, making it go from a lower or higher level, and no changes after that have an implication for sustained growth as in quote, steady state? Not clear from what he said. And we'll see models that take both these facts actually.

There are other sort of caveats when you think about theoretical modeling. Are we talking about technological improvement in the sense of TFP? Is that really what improved intermediation is supposed to be giving us? But again, we should maybe think also about transitions or even potentially poverty traps if systems get stuck.

Another caveat, savings rates are not monotone with increases in return. I mean, for one thing, in price theory, just think about income and substitution effects. One cuts against the other one. Or what about the relationships between savings and improved allocation of risk? If you improve the allocation of risk bearing, then you don't need to save as a buffer stock. So savings may actually go down and not up as a consequence of improving one piece of the financial system.

And then he makes his pitch for thinking about-- don't think broadly about savings or especially credit as an input. Think about actually how the financial system is put together. And we'll come back to that, especially when we get to the measurement part.

Does finance cause reduced inequality? He said in this review, not necessarily. And he reviews empirical evidence. There are theoretical models that claim this to be true, that the relationship is, say, favorable to reduce poverty, reduce inequality, and so on.

But certainly, in some of the theoretical models-- in some of them that we're going to cover-- improved financial systems, at least early on, cause increases in inequality, not decreases in inequality. Something along the lines of what Kuznets had in mind, actually. And then he just goes through some empirical work and doesn't come back. Not to belittle it, but he does not come back to this underlying tension.

Volatility and growth. Let's see. Before we start thinking that all the volatility we see has something to do with finance or unstable financial systems, maybe we should try to document better those sources. So this paper in the QJE is a decomposition of the sources of inequality, looking in particular at low income countries. Take it as a fact-- I'll show you a graph momentarily from them-- that there is more volatility in growth rates among low income countries. And why is that happening?

Could be that poor countries somehow or other end up specialized in volatile sectors. Or it could be a version of that, they just have a lot more quote, specialization. They're not terribly diversified over a multitude of different sectors. Could be that poor countries experience more frequent or more severe aggregate shocks sort of from a macro policy perspective. And it's even possible that poor countries experienced macro fluctuations that are somehow correlated with the shocks in which they're-- the sectors in which they're specialized.

So here's the picture. This is levels of per capita GDP and the variance. Standard deviation calculation, this morning, sort of thinking about this lecture, I spooked myself a bit worrying that it should have been growth rates and not levels. But actually when they do the analysis, they do a composition in the growth of value added.

Again, I can't do justice to this paper other than give you an overview. But what they're saying is that the growth of GDP per worker in country J, this object here, is a weighted average of the growth of GDP in the various sectors in which country J is specialized. And these A_j s are the weights or the proportions.

And then they write down a quite plausible statistical model that the growth of value added GDP per worker in sector J of country S has a country S component, a sector J component, and some residual. So that's kind of the basic model. And what they do then is a very clever, basically, variance co-variance decomposition quantifying and answering the questions that were raised on the previous slide.

The answer is 60% of this volatility is country specific. So I don't know how you want to think about that. It's not even 50-50. More than half of it is somehow a country specific phenomenon. On the other hand, there's a very non-trivial residual 40%-- almost 50, say-- which is due to the following, namely diversification is limited in low income countries. And low income countries do tend to specialize in sectors that are relatively volatile. That sets aside the issue of why, and whether there are any possible remedies, and so on.

A Model in which Volatility is Inevitable. This is one of Daron's models with Zilibotti. It's a great paper. And the idea is simple, but very clever, which is basically there is a fixed cost to opening up a new sector. And at any moment in time, of course, you have a limited amount of resources.

So you've got to choose-- you can't literally afford to do everything. You can only do a subset of things. So you're naturally vulnerable to shocks in technologies that can't cover your-- that are not able to cover your risk. Now within that there are some policy issues we might come back to at some point. But for a while, clearly, these countries are going to just be more volatile, because they're less able to diversify.

Then it gets a little more-- what should I say-- provocative. Which is, maybe volatility is actually not something you'd like to get rid of and eventually can afford to do it. Maybe it's actually a necessary ingredient for growth. In other words, if we come back to the big motivation, the idea that finance causes growth, OK, let's do it. And finance and macro stability, well, maybe you're going to have the downside of that, that there has to be some instability if you're going to get the growth.

If you think this is entirely provocative, just think about the mean variance idea of holding assets. You don't get a higher mean for free. Higher means come with more risk. So we should maybe take this seriously, as did these authors. I think this is in the QJE.

And they document that countries that have had occasional financial crises do grow faster on average. How did they measure that basically risk idea? Well, they don't want to take a simple variance measure, because that's like small or big, left or right tail. It doesn't matter. They're trying to get at a crisis. So their ideas look at the growth of credit, or actually quite negative growth, when you have a bust.

First, the boom, maybe inching along, maybe a trend. Who knows how fast? But occasionally, wham, you get one of these episodes where the bottom falls out. And I can't help but say, it's a bit odd that since the US had a recent financial crisis, everyone's kind of tearing up all the old work and starting over as if we need a whole new agenda. Whereas, countries throughout the world for, Rogoff would say, hundreds of years have been experiencing financial crises. So certainly we should pay attention. Not to say something's good or bad, but there's lots of historical experience.

So they look at the skewness of credit growth. I always get the sign wrong, but positive basically puts the mass in the left tail. And they actually have a little model, which I'll come back to in a second.

So here are some pictures. India versus Thailand, real credit growth and GDP growth. So the dotted line is Thailand, which way back to 1980, was expanding its financial system as measured by real credit. And then this is the famous, if not infamous, infamous financial crisis that started in July 2, 1997, when the Bank of Thailand realized it couldn't continue to hold the exchange rate because they had forward commitments they seem to have forgot about.

And that spread, as you know, to many, not all, but many of the Asian countries, not even nearby countries. I mean, Korea is not near, but they too suffered. However, if you look at the-- and India did not have this crisis. And India has been bragging a lot lately how clever they were to be conservative that they did not suffer from the US financial episode the way some other countries have had.

But if you look at the big picture, here at least, up through 02, you can see Thailand has kind of this V-shaped drop, and then it's right back on. My measurements show that the growth rate was only 4% after as opposed to 5% or 6% before, so maybe there was a structural shift. But this little drop doesn't affect the overall level, India's level remains lower.

So during this period, country of Thailand was one of the fastest growing countries in the world. You hear a lot about China now and, rightly so, India actually, also. But this is a big-- and I didn't realize that these guys had focused on Thailand. We have a lot more to say about Thailand in the class, but obviously we're not alone in thinking about Thailand relative to other countries. Now whether I agree with them about the financial crisis is-- or that dip is-- another story.

Now how does their model work? Actually, the paper uses this as motivation and then goes on to try to work out how you would find countries experiencing these periodic financial crises. So the idea is it's a credit constraint model. So there are borrowing constraints like collateral constraints. And if they were locked in place without any leniency, you'd have high return businesses starved for credit.

But what happens is people begin to anticipate that actually they can be more generous in their lending because of the moral-- so-called moral hazard problem, which is the government's going to bail them out-- so bail out the private sector. So this is sort of a political economy story. There's kind of like a political economy-driven boom-bust cycle.

Now, again, I don't have the equations here, but the paper's online and you can read through their model. So they're saying crises are costly. They're associated with bankruptcies and a dead-weight loss. And it's true that when a crisis happens, you get this depressing effect on new credit, and on investment, and hampering growth, which is a big conversation in the US, and actually, to some extent in Europe.

And they're saying if their model is right-- or they believe they're right-- that this sort of effect is going to be larger in countries where the contract enforceability issues are more severe like borrowing constraints. On the other hand, not too severe, otherwise they won't get this leverage effect.

So then we come to the trilogy which is finance and volatility. We did finance and growth, growth and volatility, now finance and volatility. And I don't have too much more to say about this other than to offer the reminder that that Acemoglu paper and the Ranciere et al paper suggest that volatility might diminish over time as countries have higher and higher level of output.

But as I said at the beginning, in fact, not all these sort of-- it must be more than a bunch-- it must be more than the transitivity. If A is associated with B, and B is associated with C, then A should be associated with C. And in the data, it doesn't go that way. So clearly there's something being left out here. This paper, which I became aware of more recently-- and they seem to find that, in fact, deeper financial systems are associated with lower volatility.

But I checked this again this morning, they also have in the regression, the levels of income and the growth rates of income. So in other words, they have to control for the other parts of the trilogy, basically, and then eek out this effect. Countries that are poor are often dependent on trade. There are problems when exchange rates move. There are issues about devaluations, and so on. So they kind of have to control for all of that. And then offer the suggestion that finance might be a good thing.

But believe me, countries don't know. The IMF really doesn't know either, and they're very interested in the state of the literature and in further research to try to find out. Because they have client countries who want to know what to do. They go to the IMF, for example, to get advice.

So then we come to this sort of policy discussion that's going on today. And to be candid, it seems to basically depart from this literature, from both the theoretical and the empirical literature. Levine writes a new paper now called *Regulating Finance and Regulators to Promote Growth*. It's like, well, we got to fix the problem. We know the financial crisis was caused by bad regulation, so let's jump in and regulate somehow or provide the right incentives.

So how important is it that the operation of-- how important is the operation of the financial system for an economic growth? And which financial regulatory reforms will improve financial sector operations? He's sort of assuming, in some sense, an the answer that the other literature is, and his own review was sort of much more equivocal about.

This is another example, this Thorsten Beck's work, which is highly regarded, I think, in policy circles. And the idea is to come up with a financial possibilities frontier. And again, this is driven by the idea that we're going to give countries specific recommendations. They want to know where they stand relative to other countries, and what, if anything, they should be doing.

So here's the idea. This is the, say, the financial possibilities frontier. This country is in on it. So somehow they should move up there. This country B actually has a higher level of financial depth than A.

But rather than rest on their levels, the idea is that if we knew what this frontier was, it would tell us they're actually further below the frontier than A was. They have more ground to go to get up to that frontier. And then this will get your eye here beyond the frontier. So the idea is that some countries are just basically too deep, and they should pull back.

AUDIENCE: Question.

ROBERT Yeah.

TOWNSEND:

AUDIENCE: In this paper, what sort of things go on the x-axis?

ROBERT Yeah, so this is basically a huge sort of cross-country regression with tons of x-variables. The next slide has--
TOWNSEND: gives you some sense. There are variables in there to try to control somehow for institutions. There are surveys of how easy it is to conduct business in these countries. There are other things associated with structural problems. There is even policy stuff, although honestly, I don't remember. We can look it up and see, sort of categorize all the x-variables.

Now, I'm somewhat sympathetic to looking at data. So we don't want to say this is completely uninformative. And I am sympathetic with the idea that knowing what has happened to different countries at different points in times might kind of give us pause, like leading indicators. There's a whole group.

Actually, I was talking to Ken Singleton the other day, and I don't think this work is quite public yet, but there the idea is he's in finance and a very good person. And he's trying to measure the risk premium based on observed asset prices. And they seem to be showing that when the risk premium is low, that's when you run into trouble.

Now that might sound like counterintuitive at first, but the point is, if the markets are saying, or understating, the amount of risk, then you can imagine the financial system is just pumping too much money into otherwise risky things. And that's when countries run into trouble eventually. So it's good to have early warnings, that's good. But that seems to me the challenge here is to get beneath the frontier.

In fact, I find the whole jargon a bit misleading, because there is a utility possibilities frontier which is like the bread and butter of general equilibrium economics. One point is you can't get beyond the frontier. Anyway, there's a question.

AUDIENCE: Oh, I was going to ask, in what sense does he talk about frontier? Because it sort of looks from his graph as if he was saying this is the optimal level of financial deepening for you. That's not what a frontier means. So then he's talking about pareto optimality.

ROBERT
TOWNSEND: No, that's me. So this is one instance where my thoughts kind of merged into his, so I'm the one worried about pareto optimality.

AUDIENCE: So are there issues with aggregation at that point, if you're worrying about utility possibilities frontiers and pareto optimality and stuff?

ROBERT
TOWNSEND: To construct a utility possibilities frontier, we need to specify the model. We're going to have to layout preferences, endowments, and technology. We're going to have to take a stand on possible imperfections in the credit and financial system. And just say that sometimes it will turn out that despite limited commitment or some information problems, it's a well-defined notion, and markets should allow you to end up on the frontier.

But there are other things like pecuniary externalities, where if there is no remedy, then you could end up off the frontier due to an externality. So something close to the same language works, but if I'm understanding you correctly, they're not representative consumer models, typically. They have all the heterogeneity in them, and there are issues about whether there is a pseudo representative consumer that somehow approximates the behavior.

So those are key issues in these models. And most of them don't aggregate up that way. But on the other hand, we can look at the welfare implications.

And finally, there's this paper-- an IMF working paper-- on how to deal with credit booms. And this seems to be a summary of the current consensus. I hesitate to call it that. That credit booms, buttress, investment and consumption, they can contribute to long run deepening, but they often end up in costly balance sheet disallocations, and dislocations, and more often than acceptable, in devastating financial crises whose cost greatly exceeds the benefit associated with boom.

So this is the view somehow that is pretty typical. And so you end up with this sort of goal to keep an eye on financial liberalizations to limit credit expansion somehow, although they don't quite know how. And the menu of things that they're looking at is very Basile like. They're basically ad hoc international best practice statements. As if it were obvious how to regulate the financial system. Those regulations are not coming from fundamental considerations of how credit markets work, and how they interact with the macro economy.

So is there another way, an alternative approach? I guess it's self-evident from what I've been saying in this introduction is to understand something I'm going to refer to short-handedly as Applied General Equilibrium Development Economics to understand the unit of analysis at which this can be applied, and to clarify what that is relative to other general equilibrium models in the literature.

So this may be a familiar, if shocking, picture, so to speak, in the context. If you haven't seen it before, this is a picture of a village in India. We can enumerate the household by their wealth, order them by their wealth, and look at these years where panel data were gathered in these so-called ICRISAT villages. This is [INAUDIBLE].

And here you can see the ups and downs of income. Idiosyncratic aggregate risk, there's not a lot of co-movement here. The peaks are covering up the valleys behind it. Households are not having up and ups and downs together. There's plenty of risk in the system. And this is how the consumption picture turns out.

I often refer to this in a shorthand way as the Rocky Mountains versus Kansas. And Kansas is pretty boring. It's very flat. But what it shows you very dramatically is that somehow, some way, in these village economies, they have figured out a way to smooth a lot of the risk. In fact, they come very close-- not totally there-- but very close to achieving the optimal allocation of risk-bearing that Arrow-Debreu and so on have been talking about.

Now don't dismiss this as OK, OK, we're back. And thank God it's development. We're back in villages. The point is that you can use this framework and the data are available to do this not just at the village level, collections of villages, regions in the country, or even across countries. And every single one of those things is done, and there's a huge literature. So we know quite a bit about the allocation of risk-bearing, and in fact, where systems fail.

Here's another look at sort of an economy. This turns out to be another village. And it's about the diversification issue. So if you could do all this great ex post smoothing somehow, you should just specialize in what you're good at, and your asset holdings might appear pretty specialized. And maybe the bulk of your consumption is determined ex post by borrowing, and lending, and gift-giving, and whatever else they're doing.

But no, not in medieval England. They divided up their land in an extraordinary way. A typical farmer would have 60 or 70 plots fragmented throughout the village. This is also true in Bolivia, up in Altiplano and so on, running down different elevations. So the point here is not all economies are alike, not even all villages are alike. And looking at data in this case, partly through this institution, you can see that the ex post allocation of risk-bearing must evidently be more limited. In this case, it took a private information model to try to explain that outcome.

Again, to reassure you that this is not just macro, it's macro development, macro devo, devoted to macro, or I don't know, you can turn that any way you want.

[LAUGHTER]

Someone made a joke once, if in the slides you don't have a picture of a villager or something, then you're not really a development economist. I actually took this picture. But so you got land, labor, and capital.

[LAUGHTER]

OK. So I love villages. And the reason is, you really don't have to make things up. You can actually measure things and get an approximate sense of what the preference, the endowments, and technology are. Preferences are a bit trickier. So that's the way the language we use as general equilibrium theorists-- preferences, endowments, technology, as I said in answer to the earlier question.

And then you can do this kind of adding up. So this is like taking these villages, the Thai villages, and adding up all the households in the village with the financial accounts. We'll get to that in a minute, that's the measurement part, the midpoint of the course. And you can see in one region near Bangkok, village output-- GDP, except it's not national-- is going down. In the other regions, it's kind of going up. This is a second panel, so to speak, is where their savings is put into real or financial investments. And here you have the balance payments.

So it shouldn't be too much of a stretch to realize that if you have the measurement, you can indeed zoom in and zoom out. You can go from households out to the whole country, and intermediate steps in between, and use these standard tools. In this case, we've ended up with the tools that international economists use, I'm using them internally within the country. But at least if the measurement is in common, we are allowed to do that.

I'll just pause briefly to talk about the data. I've already mentioned we have it, and you should feel free to use it. It's quite extensive. It's 15 years worth of data. And some of it's monthly. It's both rural and urban. Yeah, I'm in city neighborhoods and spread out throughout the kingdom.

This is zooming in and zooming out, literally. So here you can see almost like an aerial photo with the village locations where we collect data. All the way over here you can see zooming way out, where it is basically. It's somewhat near Bangkok, this particular sample site, and this is sort of the intermediate level. Here we're plotting at the level of provinces the wealth level, which is in common with those two diagrams.

Well, we have this extensive GIS system. I've made a campaign of putting all available secondary data that I could get a hold of over the years, a lot of it's available through Dataverse, Harvard MIT. And we are in the process of putting this onto this common GIS platform where you can look at bank locations, and factory locations, and road networks, and compute travel time, and so on.

So one of the-- if you're interested, I can have my GIS person maybe have a special session and show you a little bit about how to use this system and the kind of work that's possible to do with it. It's coming. There isn't that much work in economics that has explicit general equilibrium spatial modeling, but it's coming. So it's a wide open and interesting research topic.

So what is this general equilibrium development approach? Well, it's not just individual maximization. It's not just partial equilibrium. It's general equilibrium. So things like the economy-wide interest rate and wage rates are very much on our minds.

From a development perspective, it's not just the impact of some savings account or improved credit product on individuals, it's about efficiency of the system. In other words, it's not just on the credit side, it's kind of on the lending side. The money for lending comes from savings. You have to think about intermediation and the flow of funds, and judge efficiency using this pareto criterion.

It's not a foregone conclusion what the best fitting market or contract structure is. That's something that comes out of the analysis. That's why it's so good to have the micro data, because you can actually test. You could have village-- one village doing quite well and a whole region in another part of the country doing terribly. But we don't have to guess or assume, because we'll in the course acquire some tools for doing that analysis.

So clearly it's not the ever varying Washington consensus, which is for liberalization and now for regulation. Look at Europe, just going back and forth not knowing what to do. The debt's too high. We need to restrain it. Oh, my God! We need the stimulus. So we think through those things at the same time with these models.

And I don't mean to be saying it's all about the US, obviously. It's about India. It's about the Philippines. It's Kenya where they are allowing cell phones as opposed to Thailand where they're effectively ruling it out. So those are the debates that are happening in developing countries.

You've got some stuff on the website if you want to see. I will be tracking Thailand a lot, but I've also been writing a book on Mexico. And you'll see me throw in some slides. I think the danger here is you see too much Thailand, and then you begin to think it's all about Thailand. Well, A, I'm not the only one worrying about Thailand. But B, seeing other countries and seeing the same analysis done in two different countries really brings this stuff to light. So that's why Mexico is sometimes paired in these slides.

So the goal here is to explain, yes, to understand what's out there, but it's also normative to try to come up with policies that allow more inclusive financial systems if the data indicate that. But also to think about the overall efficiency, and to think about market design and optimal regulation. There is some logic in all of this, basically. You assume something or several things, you go out there and test. It may fit. If it does fit, you've understood the financial contracts and the imperfection. If it's full information for risk sharing, then we have this wonderful standard and it's clear, at least at the village level in India, you shouldn't be intervening with particular households.

On the other hand, if you reject, maybe it's due to a moral hazard problem, the problem that people don't repay and they walk away from their investments. The data can help indicate that. Now then the question is, is it still constrained? Maybe it's second best optimal. Maybe this first best standard is an illusion. But maybe when it's second best, things like allowing more goods to play the role as collateral, like changing the legal system, those kinds of reforms might be indicated.

Now there is a lot of general equilibrium literature to sort of contrast with this general equilibrium development point of view. This goes way back to the foundations of general equilibrium. Herb Scarf, and his students, Chauvin and Wally, that's called Applied General Equilibrium and does not allow uncertainty.

This type of modeling is still used, although it's in kind of pockets. It's used within the World Bank. All our climate guys over here at MIT use this stuff. That's the basic conceptual framework, the CGE model, that lies behind these conclusions about how climate change is going to influence the economy. So it is quite widely used. And there's some great review articles. And it does have some key strengths.

Computable General Equilibrium has this strength of drawing on the national income and product accounts and input-output matrices. That's basically the successor to the Supply General Equilibrium. And then we have the more macro-like, if I could say so, Dynamic Stochastic General Equilibrium models.

So you associate this with Prescott, for example, and real business cycles. So it's great on dynamics. It's great in being very clear about shocks. However, we anticipated this, it largely assumes a representative consumer. As if you had complete markets that allow this kind of Gorman aggregation with certain preferences. So in that world, you're not going to have redistributive wealth effects.

And it is kind of interesting in sort of a history of thought point of view, that despite the early battles in macro, this DSGE stuff basically took over, and largely without modeling the financial sector. And so I think that's why people felt rather flat-footed when the financial crisis came along. So there is stuff, sort of dynamic general equilibrium models that started with Bernanke and Gertler.

I keep looking at Alp over there because I know that we feature that just now in the macro lecture. It is kind of built on micro underpinnings and a certain view of a costly state verification as an underlying imperfection. It does feature a lot the role of credit and a financial accelerator.

But largely, with some exceptions I'll say momentarily, this stuff is an aggregate of model. And it's quite elaborate as a model. You have the Central Bank. You have households, entrepreneurs, but entrepreneurs are somehow different from retailers. And retailers are somehow different from capital goods producers.

And certainly in early versions of Christiano and Eichenbaum, and so on, they actually only look at the aggregates generated by that model. They never they never assign these sectors to data. It's not tested. It's not part of the way they're doing business. So maybe they don't need to if they get the aggregates right, but this is a picture of India. This stuff is used by central banks. If you want to see one in Brazil, it's called samba or something. I'm not sure if that's the music.

[LAUGHTER]

They have one. It's on the reading list. But I must say, in a bit more optimistic vein, things are starting to come together. Hsieh and Klenow wrote papers on India and China on the distribution of firm size. And now it's almost becoming standard that if you write down one of these models, you have to look at the implication for firm size. Or some key parameter in the model is going to be calibrated against the distribution of firm sizes in the US, for example. Just like Rajan and Zingales kind of started that research path.

So the latest Larry paper definitely uses that, and uses other financial variables, starting to look at bankruptcy, and so on. So one can be somewhat optimistic that these seemingly similar, in the sense of general equilibrium, but obviously diverse attacks on how the financial system work, or isn't even necessarily model. They're kind of coming together. And I think the place where it arguably has come together the fastest, and where we really quite understand quite a lot is in development economics.

And it features the measurement at the household level using corporate accounts. This is again the midpoint of the series of lectures. So we can get at TFP, productivity change, wealth, rates of return, treating households just like the firms are treated in corporate financial accounts, income statement, balance sheet, statement of cash flow. Occupation choice is a key ingredient in these models, because typically in developing countries, you see households making transitions. They used to be in agriculture. They set up a firm, maybe become wage earners. So that's a big part of almost all of the models.

There's tests of these micro underpinnings. I listed a few papers here. There's some warning that underpinnings do matter, that things are rare. It's rarer that one kind of underpinning is a stand-in for the other ones, or at least it does not always work out that way, and the Matsuyama paper is a pretty good reminder. Well, actually he more says things aren't monotonic. And Boyd and Smith and Gertler and Rogoff have examples of how these underpinnings really matter to the macro or regional phenomenon.

So part of-- part of the agenda here is measurement, and it's not just measurement at the household level. It moves from the national income accounts and balance sheets, and so on, to differences of balance sheets, so it's essentially the flow of funds. So if there's one thing that seems obvious, but actually remains challenging, is that if you wanted to model the financial system in a country, you should look at the flow of funds data.

Because that really tells you, at least at the level of aggregation that is presented in the public data, what financial instruments are actually used, who's taking the debtor-lender position in those instruments. You can certainly see very well with flow of funds, the movement in and out of the formal financial system. Because that's where the measurement is the best, actually, because banks have to report stuff. They try desperately to hide a lot, but at least flow of funds in and out of the banking system is available even for low income countries.

Turns out the IMF is loaded with data. People at the fund haven't been using it. But now it's sort of an awakening that there's a lot of things that could be done with flow of funds data. And I'm in touch with those guys, so potentially if you're interested in a particular country, get you the latest flow of funds data.

You have to keep an eye on things, though, in the sense of the informal sector is typically not measured, but in these countries can be really key, especially in low income countries. And unfortunately, you don't usually get the geography, although we've had some projects we've encouraged with Mexico and are kind of working with Brazil to get the geography in there.

We'll come back to this flow of funds diagram, but it basically makes the point that you can talk about-- Here is actually a village again with the transactions of the village with a not-for-profit corporation, financial corporations, non-financial corporations, and government, and so on. So just to belabor the point again, the way that you measure in principle is common. And then you can zoom in and out depending on what you think might be key, and take a look at orders of magnitudes of things.

You may not realize it, but I'm basically following the order of the syllabus. So after we get through the measurement part, including flow of funds, we'll talk specifically about micro level tests of insurance, of credit. This is too complicated for today, but we'll get into these obstacles to trade, and how to test whether it's a moral hazard problem or adverse selection problem. Test incomplete markets against information constrained markets.

This is a lot of material, and I'll be mindful of that. I'll at least try to give you some examples of how this analysis is being conducted. And we end up back with Applied General Equilibrium Development Economics, which is going to be you know what we're going to do in class starting on Thursday. We're going to start with-- we've already got the reduced-- the patient choice models. There are several Banerjee Newman, [INAUDIBLE], Lloyd-Ellis and Dan Bernhardt, Aghion and Bolton.

The key parameters of the financial underpinning.

We'll for the second lecture of the class, we will be sort of having all the ingredients, the micro, the estimation, and the simulation. This is another sort of genre in the literature. This is financial-- this one takes the expansion of the financial system as exogenous. This one tries to make it endogenous.

Key contributors are, say for example, Greenwood and Jovanovic, [INAUDIBLE] and Smith. Entirely theoretical models basically in the style of Ross Levine, taking a stand on how intermediation works, showing, for example, that inequality might go up before it goes down, but not taken seriously enough in the sense of going to the data, which is what we'll talk about next time.

I said quite a bit during the lecture about policy and assessing policy. So Thailand, for example, as you saw, had financial deepening going on, and at times, rather substantial financial deepening. Once we have these models and we've kind of estimated or calibrated the key parameter, we can do these welfare experiments. We can actually say, who benefited, and for that matter, who lost from the expansion of the financial system?

The beneficiaries are like these poor credit constrained households that don't have access to the financial system. But over time, as they exogenously are allowed to enter that system, they have huge increases in their welfare and well-being. Why does somebody lose? Well, that growth of enterprise means increased employment. It's pressure on wages.

In the model and in Thailand, the real wage eventually shoots up rather dramatically. That increases the cost of doing business and the profits of entrepreneurs can drop. So this is the wonderful part. Now, I don't mean to say this model is wonderful. It has a lot of limitations, which I will share with you on Thursday. But what's wonderful about it is that you can actually go through these distributive welfare gains and losses types of calculations.

This one with endogenous financial deepening comes back to my comment on the slide which had India versus Thailand, and I said something obscure about I had another view of what happened in Thailand. Well, part of that growth was preceded by a real flat. GDP went basically flat-lined. And what was going on? Well, they had certain interest rate restrictions on deposit rates and lending rates. There was an oil shock. Prices were going up, and money was flowing out of the financial system.

The banks ran into trouble. The government essentially took them over, and the economy goes flat-line. You should worry about this. It's not necessarily the case that quote, regulation, or in this case, national-- almost close to nationalization of the banking system is necessarily the way to deal with the financial crisis.

Now how on earth are we able to model this? It's really quite simple. We just create a wedge in the original Greenwood and Jovanovic model, which is the spread between the borrowing and lending rate. And we say when the more the-- sorry, this sounds very market-oriented-- the more the government does, the more resources gets squandered, and that inefficiency wedge kind of increases over and above the cost of intermediation.

And at the calibrated parameters, that's actually enough for the model simulation to go flat. But likewise, then we can liberalize the system, which Thailand did, and back out. And then we'll go way beyond these two the lecture next Tuesday.