

**STEG Virtual Course on  
"Key Concepts in Macro Development"**

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**Lecture 8: Barriers to technology adoption: what we know from micro  
empirics**

[Lauren Falcao Bergquist \(Michigan and CEPR\)](#)

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Q: Is there a consensus on how much is driven by market inefficiencies vs. frictionless factors like labor cost, adjustment costs, etc.?

A: I don't think we have a clear number of how much comes from low adoption due to it not being profitable versus market inefficiencies. There is evidence that both of those happen, depending on the context.

A: I think this is an area that is wide open for contemporary research. One way I might rephrase what I think you're answering is whether there are pure inefficiencies, or whether there are instead high transaction costs and frictions -- such as transport costs -- that cannot be 'fixed' just by allowing market forces to work more freely. My personal suspicion is that there are a lot of real costs (transport, transaction, etc.) and relatively fewer pure inefficiencies... But that's not based on any systematic analysis, just an impression. And it's worth noting that there are other issues, such as behavioural constraints, that blur the line between 'pure inefficiencies' and 'real costs'... So lots of things potentially going on.

A: This was basically what I was asking yes. Although I have limited knowledge of agriculture, I was thinking that many of these technologies will eventually require less labor, and farmers may be reluctant to invest in technology that reduce labor requirement due to a mix of low labor cost and some form of social responsibility to employ workers in their community

Q: I could imagine that subsistence consumption constraints could weaken the impact of cash grants on technology adoption when credit constraints are binding. Do we know anything about this interaction?

A: Kevin Donovan's macro work has this flavor. People are locally extremely risk averse when they get near the subsistence requirement.

A: An empirical question might be whether households further from the subsistence margin are more likely to adopt new technologies. In many cases, this doesn't seem to hold. Technology adoption is often very geographically based, with technologies working better in

some places than in others. The patterns of technology adoption across households often seem complex, which suggests that the subsistence constraint is not the whole story...

Q: What happens in developing countries or regions where farmers do not have access to bank credit or where banks do not offer credit because farmers do not have sufficient forms or documents to support their need for credit? there are real and institutional restrictions, right?

A: This is exactly the issue when we think about credit constraints. In developing countries, farmers may not have access to credit, whether it is because there aren't any institutions or because those don't lend to poorer individuals (usually as considered more risky/less profitable). The research that looks at credit constraints looks exactly at that - what happens when we offer credit products to those individuals. One large area of research that has focused on this is the microfinance literature.

A: As you mention, it also relates to land titling efforts. Some people lack access to credit because they lack collateral because they have no way to show ownership.

Q: This question is not exactly about agriculture, but I was wondering if there are evidence on the role of technology clusters in information diffusion and learning? Or are technology clusters more about labor mobility and startup turnover/creative destruction?

A: There is some evidence of learning spillovers across farmers, such that farmers do seem to learn from neighbors... And this relates to what Lauren is getting into next.

A: Dating back to Alfred Marshall, technology spillovers has always been one of the theoretical reasons for industrial clusters. I think there is less empirical evidence measuring this, however, and it is a difficult question to study, although it seems clear that it occurs. Thick markets for specialized labor and intermediates are the other two "Marshallian" benefits of industrial clusters.

A: There is some research about contagion/tech diffusion and how best to maximize tech adoption across farmers. Do you introduce the new technology by picking the central node of the network, do you base it on geographic proximity, do you assume that people who are more similar are more likely to adopt from each other. So in that sense, that relates to your questions i.e., whether you need multiple sources geographically close to each other (cluster) to maximize adoption. I also think your question relates to some of the geographic/spatial literature (in for example urban settings) that look at the role of clusters of firms on spatial spillovers.

Q: I was wondering if there is evidence on role of Private/NGO Field agents on learning and adoption of technologies?

A: It's an interesting question. A number of NGOs try to work alongside (or sometimes in place of) government extension workers. I don't think I've ever seen a head-to-head comparison of the two groups, in a fair comparison. You could certainly imagine that there would be differences in the effectiveness of extension that is incentivized differently. But it isn't always clear how to make a fair comparison. For instance, what is the right outcome measure? Is it

getting farmers to adopt technologies, or is it actually making them better off? If you incentivize agents to promote the adoption of new technologies, they may be able to do this (at least in the short run). For some NGOs (and many private firms), there is a tendency to incentivize adoption of technologies... But often we aren't sure that these technologies are actually profitable at the farm level.

A: A few national programs (e.g., Uganda in the early 2000s) tried to restructure their public sector extension programs to be semi-privatised service providers. The idea was to make the extension workers more responsive to farmers. It was conceived as an Advisory Service (NAADS) that would emphasize responsiveness. But before it was really possible to see whether this was effective, political pressures resulted in a redesign of the extension system about ten years into the reorganization... You can see the current version here: <https://naads.or.ug/about-us/>.

A: I've worked (with Kyle Emerick, Elisabeth Sadoulet and other co-authors) on a project that looks at something quite similar to that. We compare the more traditional government extension system to what would happen if we use private input suppliers instead. And we look at how that affects adoption of a new technology as well as whether these private agents can target farmers that are most at need of the technology/would benefit the most (rather than as Doug is pointing out targeting farmers that will make dealers better off at the expense of farmers who need it the most). We do find that private input dealers do increase adoption compared to the more traditional extension agents as well as target farmers who would benefit the most from the technology.

A: There is an ongoing debate on efficiency of government extension workers versus private extension in promoting adoption of new technologies, even though there is always an issue of sustainability. I will go through the article to learn more.

A: Again, I think it's important not to incentivize extension workers to promote adoption... because I suspect that there are many technologies being promoted that increase physical productivity but do not actually result in higher profitability at the farm level, at least for some farmers. If you think that returns to technology adoption are heterogeneous, then you should be quite careful about incentivizing adoption, as opposed to showing farmers the technology and allowing them to experiment with it.

Q: In the context of the crop fluctuation problem, how local are the markets for these crops? To consider general equilibrium should we think at the municipal level, national level or regional level?

A: Moser, Barrett, and Minten have a paper on this in *Agricultural Economics* in 2009. "Spatial integration at multiple scales." They find decent integration at subregional levels but not regional or national.

Q: Currently the country is not storing grain for farmers in Kenya this due to high supply from neighbouring country at cheap price from Uganda and Tanzania

A: There are indeed a lot of cross border trade between neighboring countries - in your questions Kenya and Uganda/ Kenya and Tanzania. And those probably affect the choice/decisions related to storage. It's also interesting to think about what happens when

imports aren't possible. I am happy to talk about this in more details as I've worked on this recently.