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I'd like to begin by thanking Marcel for all of his work in organizing this conference. Looking at all the faces here, he has succeeded in gathering together a rich collection of people working on a diverse set of topics but unified by our common interest in microeconomics in Africa.

I am very grateful for this opportunity to speak to our community. I must admit, though, that my gratitude is tempered by the realisation that by giving a lunchtime speech, I am now officially old.

When considering my remarks, my first and very strong impulse was to present a summary of one or the other of my current research projects. But I was promptly dissuaded, my overhead projector was seized, and I was required to allow you to finish your lunches in peace.

My next thought was to present my take on what our field is and to provide an overview of the relevant microeconomic literature. Collier and Gunning, however, have released me from that responsibility with their superb survey in last year's *JEL*. While I disagree, of course, with parts of their discussion, these disagreements are too scattered and too minor to hold your interest.

Instead, I want to discuss a more abstract issue concerning microeconomic analysis in African countries. This is an issue in which I think we can make progress, and where such progress will clarify our analysis of microeconomic reality in Africa, and which will have lessons for social science in general.

The fundamental notion that defines microeconomics is the individual optimising agent who interacts with other such agents in a strategic (or in the limiting case, competitive) environment. These interactions, in the context of given performances, technologies and social institutions generate an equilibrium allocation of resources.

This is all well and good, but it is too abstract to be of much use. So we operationalise our models by making assumptions to incorporate salient aspects of reality. So economists tend to assume on the production side that there are firms that maximize profits, which interact with households that maximize utility and that these interactions take place through markets. This gives us the core general equilibrium model that is foundational to our discipline. And of course we add many and diverse bells and whistles to address particular problems of interest.

As development economists, we are used to making rather severe alterations to this standard model. We even modify the definitions of the basic units of analysis. We note, for example, that the conceptually distinct functions of the 'firm' and the 'household' are often merged. The agricultural household model was an early and prominent example; models of micro-enterprises have taken advantage of similar insights.

However, despite these and other innovations, many economists (including myself) working in African contexts remain uncomfortable with the conceptualisation of the core units of analysis in the neoclassical model. The problem has less to do with the imputed motivations of the core units of 'household' and 'firm' than with their very definition. The boundaries of the household, the firm, and the market are *not* distinct. They are grey, they are mobile, they are permeable. These are abstract categories that do not fit reality. In some instances, the simplifications that they bring is valuable, but in others they are terribly misleading.

What I'd like to do in the next few minutes is to 1) discuss the imperative to break down our current rigid distinctions between households, firms and the market; 2) propose an analytical approach that permits us to lift the veils of these categories in those situations in which they are misleading; and 3) to provide an example in which smudging these boundaries is feasible and leads to new insights.

Let us consider first households. Even conditional on defining a unit, households have been problematic for economists for years. There are several papers by people at this conference that have cast doubt on the still largely conventional 'unitary' household model. Kimhi's paper and that by Quisumbing and Malluccio are excellent examples of the now I think overwhelming evidence that households cannot simply be treated as if they were single agents optimising a single budget constraint. Even the more general model of the 'collective' household introduced by Chiappori — which assumes only that the intrahousehold allocation of resources is efficient— seems to be inappropriate in some circumstances. Dercon and Krishnan and Goldstein present evidence from Ethiopia and Ghana that risk is not efficiently allocated in at least some households.

Our problems are deeper, though, because of the difficulty of defining the boundaries of the household. There are things that look very much like market transactions that occur within African households (like purchases of labour between spouses operating separate enterprises, for example). There are family-like interactions that take place across households (like the commonplace and ubiquitous exchange of cooked meals in Hausa villages). Then, of course, there is the flow of people (especially children) across households. A multitude of writers (Aluko, Okali, Obeng, Callaway) in a variety of disciplines have made very clear the indefiniteness, permeability and the flexibility of the 'household' in many African contexts. Rather than conceptualising

membership in a household as a zero-one event, it might be more fruitful to think of individuals as being participants in a number of different types of social relationships of varying qualities and intensities with a variety of different people.

I am describing, of course, the constituent links of a social network. The two crucial points are 1) that drawing a sharp line around a group of individuals and calling them a household does not make it so. There are a variety of different kinds of ties within the household, and a variety of overlapping ties between individuals who are labelled in different households. Making sense of this is our challenge. 2) These links are *chosen*. They confer benefits, imply responsibility, and require effort to create and maintain.

Sam Belinga and Jane Guyer put it very nicely in their 1995 *Journal of African History* paper. They use the term 'wealth in people' not in the old neo-Marxist sense of the 'lineage model of production', but rather to describe the logic of investment in diverse and complementary social relations. They say 'the idea that rights in people could be the basis of accumulation ... resonates strongly across the theoretical spectrum of African studies, to the extent that the concept is now used in a very general way as a shorthand for many syndromes of inter-personal dependency and social network building that clearly involve strategising, investing and otherwise cultivating inter-personal ties at the expense of personal wealth in material terms'. As economists, we should have something to say about this process of investment and accumulation - or in their felicitous term - 'composition'.

The individual's choice as he or she invests in social connections within and across conventional household boundaries is not so much a simple process of accumulation (that is, just building up the number of ties) as of 'composition,' developing an appropriately complementary set of strong and weak ties. On the productive side, one can find astonishingly similar accounts of entrepreneurial behaviour. Sara Berry's account of motor mechanics in Ile-Ife is particularly instructive as she describes the array of qualitatively different personal ties that support an individual's career path. Some of these lie within conventional firm boundaries (e.g. the apprentice-master relationship); some cross conventional firm boundaries (supplier - purchaser relationships, or subcontracts); [The work of the Industrial Surveys in Africa group on RPED data has shed much more light on these kind of connections over the past few years.] and some are fascinatingly ambiguous — for example, partnership relationships. Berry observes that 'mechanics sometimes cooperate with one another to reduce risks or increase returns', and goes on to explain risk-pooling arrangements. Another strategy some used was 'to form partnerships with men whose specialities were different from their own'. Some partners jointly employed apprentices and journeymen; most keep separate accounts, but pooled some credit risks. Gracia Clark in 'Onions are my Husband' describes similar arrangements among traders in Kumasi central market.

How do we make sense of all this? As economists can/should we revert to the individual as the actor, and yet not lose sight of the fact that these individuals produce and consume — at least to some degree — with others? On ‘should’ the answer is yes and no. For some economic questions, sweeping away the false veils of the firm and the household is essential to improving our understanding. For example, I think that this will be necessary in order to move forward in our understanding of risk management and human capital investment. It may be necessary in order to understand the apprenticeship system; almost certainly it will be required in order to understand small firm growth, which I think is as much a process of ‘composition’ as of simple capital accumulation.. For others questions we can probably muddle through using our standard approach. For example, these are probably second order issues for many firm productivity studies.

On the question, can we deal with this? The answer now appears to be yes, but we’re just beginning to understand how. The crucial overarching concept is that of the social network. Now, there has been a lot of work in related disciplines, particularly in engineering and in sociology, on characterising the performance of networks and on describing their properties (the famous travelling salesmen problem, for example). However, only very recently his work began on the crucial question of endogenous network formation, in which the nodes of the network (who after all are people) *choose* the links to be formed. Jackson and Wolinsky in *JET* and Bala and Goyal forthcoming in *Econometrica* provide alternative theoretical goals that enable us to proceed. One promising idea is to characterise the Nash equilibrium of the network formatted game.

Here’s how it goes. Conditional on the choices that everyone else has made, do I value the link to you (taking into account the indirect value to me of your place in the overall network) more than the resources I would have to devote to maintaining a connection to you? If so, I’ll invest in this connection, otherwise not. You, of course, are making a similar choice, and the value of the connection may or may not depend on both of our choices. For example, in an information network I may not need your cooperation if I can obtain information simply by observing your behaviour. In a mutual insurance network, however, you had better agree if I am to be relying on you!

Technically this gives us a huge set of inequality constraints - 2 for each pair of individuals in the community. Given data on realised network connections and on the relevant characteristics of individuals, the system of inequalities provides the structure of an econometric model of endogenous network formation. Think of this as the network-based complement to studies like Eliana La Ferrara’s, that look at individuals’ choices to join groups. What’s exciting about this?

1. It enables us to characterise the processes through which individuals *compose* a social network.
2. We don’t want to be extreme — we can’t make everything

endogenous. But this does give us an approach to understanding heterogeneity in certain institutions. For example, take basic marriage patterns as exogenous. This kind of network reasoning can help us understand why one adult farms jointly with her spouse, while another devotes extra resources to building a business relationship with a sibling, for example

3. This approach enables us to observe and quantify in a theoretically consistent way at least one important component of social capital.

There remains a set of significant technical issues: multiple equilibria (here, acknowledging heterogeneity helps to reduce the set of equilibria); various refinements to the equilibrium notion; difficult computational problems. All can be resolved in some cases but not in others. But progress is possible and we will soon see empirical applications of these ideas.

How does erasing the sharp boundaries between households, firms and markets, and taking care to understand the choices that lead to social interconnections help?

Here I will use an example I'm working on with Markus Goldstein and Tim Conley at Northwestern. Small scale commercial farmers in Ghana are learning how to use a new technology, specifically fertilizer on pineapples destined for the tables of Europe. These farming firms are run by individuals embedded in social relations in villages and towns. They face a problem: put simply, how much fertiliser should they use? Extension agents provide advice, but that advice has proved ill-suited for their economic situation. Do farmers share information about and learn from each others' experiences with the new technology? There has been excellent work (including by Kees Burger here at the Centre) on this kind of social learning in the past, but there has generally been a serious identification problem. As economists, we observe diffusion — a gradual spreading of the new technology. That may be caused by social learning or it may be caused by some unobserved spatially correlated factor, like the extension of a marketing system for a new input. In our data from Ghana we are able to actually observe who is talking to whom, so we can map out the precise information network. Hence we can separately identify spatial and information effects on the use of the new technology. For example, if one farmer uses a lot of fertiliser and achieves high profit, we can trace the effect of that experience on other farmers as news about it flows through the information network.

Moreover, because we can trace the influence of information through the network, we can quantify the value to a farmer of the network as a whole [and thus measure this component of social capital]. We can also identify the value to farmers of particular information links, and thus endogenise the process of network formation. Are you more likely to invest in information link of someone who possesses information that is more valuable to you?

In the end, there is a policy implication. This helps us think about the best way to design an extension intervention, given that we can't provide extension services to each farmer. But the more general lesson is that it is possible to use these tools to analyse non-market interactions that cross the conventional boundaries between firms and households. The very same techniques can be used to examine for example insurance networks that overlap household boundaries, or webs of partnerships among entrepreneurs.

I think that it is essential that we do this. The blurring of these boundaries is particularly salient in many African contexts. The most important reasons for this particular salience are described by Collier and Gunning in the *JEL* review. Many African economies are characterised by a high-risk environment, inadequate infrastructure and reliance on spatially-concentrated and intense social networks. Hence our simplifying categories of 'firm' and 'household' are particularly problematic in Africa. However, these considerations are relevant, if perhaps less obvious, more globally. This is another area in which work in Africa can contribute to progress in social science everywhere.

Thank you for your indulgence.

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